The Electrical World.

VOL. XXV. NEW YORK, APRIL 20, 1895. No. 16.

PUBLISHED EVERY SATURDAY BY

THE W. J. JOHNSTON COMPANY, Limited,

253 Broadway, New York.

Established 1874. Incorporated 1889.

Telephone Call: Cortlandt 924. Cable Address: "Electrical," New York.

New England Office, 620 Atlantic Ave., Boston.

Western Office, 936 Monadnock Block, Chicago.

Philadelphia Office, 927 Chestnut Street.

SUBSCRIPTION IN ADVANCE, ONE YEAR, $3.00,

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253 Broadway, New York.

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THE STANDARD TELEPHONE COMPANY.

There have been no developments during the past week with respect to the Standard Telephone Company, the officers stating that they are engaged in completing their organization and will have no technical details to communicate until that work is finished. It is understood that negotiations are pending with several persons controlling switchboard patents, but, beyond the patents described in our last issue, no further official announcement has been made in regard to those now held, and for which such sweeping claims have been made. As this is the first instance in which such secrecy has been observed with respect to electrical patents, further information will be awaited with interest, but it is scarcely to be expected that anything of a very startling nature at this stage of the art of telephony can be disclosed. The great reductions in rates now being made by Bell companies throughout the country will doubtless, it may be added, forestall some of the plans of the new company.

GENERAL ELECTRIC AND WESTINGHOUSE.

As we go to press no official statement has been made in regard to the terms of the agreement supposed to be in process of negotiation between the General Electric and Westinghouse companies. The only information vouchsafed to the public is that the necessary details are being perfected, which necessarily, on account of the number and importance of the patents concerned, require time. The financial papers, on the other hand, have printed rumors to the effect that negotiations have been brought to a halt, one of them stating that the opposition of Mr. Geo. Westinghouse has been the cause. While Wall street appears to be dubious as to a successful issue, and inclined to consider the affair merely as a speculative move on the part of some of those interested, it is probable that this view is itself based upon speculative motives. In the meantime it is only fair to accept the assurances that the matter is being prosecuted in good faith.

GAS BATTERIES.

We print elsewhere the second article of Mr. C. J. Reed on gas batteries, which is particularly interesting from showing the influence of the nature of the surface of the electrodes on the electric action of such a cell, and the high efficiency that may be expected from a gas battery of the kind described. The experiments forming the subject of the present article demonstrate that the difference between plain platinum electrodes and those with a surface of platinum black is enormous with relation to their efficiency in a gas cell, it being stated that thousands of tons of platinum foil would be required to produce the same effect as a single ounce of platinum black. What is of still more interest, however, is the energy efficiency of a cell such as that described, the writer stating that it may exceed 33 per cent., and that one could probably be constructed with an efficiency of 80 or 90 per cent. While the experiments with oxygen and hydrogen have little direct practical value, they are, nevertheless, of importance in showing that a gas battery may possess a high efficiency, and therefore have a bearing on the general problem which includes the utilization of gases from ordinary fuel. The comparatively small capacity of a gas cell is apparent from the figures given, from which the deduction may be made that it would take over a year of continuous operation of a cell such as that described to deliver the amount of energy an ordinary dry cell will develop before exhaustion.

PATENTS FOR ELECTRICAL INVENTIONS.

In another column we print an interesting article pointing out the numerous evils incident to our present patent system, and suggesting some remedies. The conclusion to which one is forced

by a consideration of the disadvantages under which the poor inventor labors is that patent law, as now administered, practically deprives him of the fruit of his labors instead of, as intended by its framers, securing him in its enjoyment. It is not alone the poor inventor who suffers, for the course of recent patent litigation shows that, even with the most powerful financial support, the delays of law frequently act as a bar to the establishment of rights until a favorable decision becomes of mere historical value. Where the injustice is so manifest it would appear that a remedy should exist near at hand, but this does not seem to be the case. The monopoly conferred by a patent is so complete that it would be unjust to the public and to the claims of prior inventors to permit it to be established upon the almost necessarily incomplete examination of a patent office examiner or a perfunctory adjudication of a court. The monopoly is granted as a reward for a meritorious service to the public, but possession cannot be secured in the face of denials of the performance of the service until their falsity is proved. As we believe that none would care to place the absolute grant of such a complete monopoly into the hands of patent office examiners, litigation is a necessary evil, and efforts should be directed to mitigating its consequences. It is true, as pointed out by Mr. Talbot, that the patent office might be more severe in its interpretation of the word "invention," but this would not affect the most important cases, in which there is a real doubt as to the claims of different inventors or of the right of the enjoyment of a monopoly. The plan proposed by Mr. Talbot would not only shorten the period of litigation and reduce legal expenses but also produce more satisfactory results should the official assessors proposed be men of technical as well as of legal qualifications. A further step in the right direction would be the institution of patent courts presided over by judges scientifically competent to appreciate the technical points upon which they are called to deliver an opinion, for it is only rarely that patent cases can be rationally decided upon purely legal considerations, without reference to the technicalities involved and expert knowledge of the state of the art.

ELECTRIC LEGISLATION.

Numerous bills affecting electrical interests, as will be seen from our account in another column, have been introduced before the Albany Legislature. While many of the measures are not antagonistic to the electrical industries, yet, the reverse is the case with some, particularly that whose object is to regulate the cost of lighting, and another providing for meter inspectors whose salaries are to be paid by electric light companies. The former is undoubtedly a "strike," while the latter, which may pass, is probably more in the interest of political patronage than intended to safeguard electric light purchasers. Another bill with nothing to commend it is the one requiring electrical workers to be licensed, which is an unwarrantable interference with the rights of both employees and employers. The interest of employers to secure good workmen, and of those having work done to see that it is properly executed are sufficient in other trades, and the element of danger in electric lighting work is so efficiently provided for by insurance inspection that the licensing of workmen can accomplish no other end than the usual one of securing advantage to the incompetent at the expense of employers and of really competent workmen. The proposed measure requiring the adoption of fenders on street cars is one that should be passed into law, and it is little less than disgraceful that there should be a necessity for legislative action on such a subject. Street railway companies are none too popular with the public in larger cities, and their refusal to adopt this reasonable precaution except under compulsion indicates a lack of both business sagacity and regard for humanity. A bill now before the legislature that should enlist the support of electric light managers is that permitting central stations to make and sell artificial ice and carry on a cold storage business, though if the latter provision were dropped, it is probable that the handicap under which the measure now seems to labor would be removed. The desirability of an adjunct to a central station that would permit the employment of its machinery during the hours of light load is evident, and an ice-making plant seems to offer in a high degree the necessary qualities. We see no reason why a bill to attain such a desirable end should be burdened with the proviso referred to, as the same object may be attained without thus jeopardizing the main end in view. The bill to create an Electric Light Commission is one that might accomplish a good end, if for no other reason than the benefit to be derived by station managers from the comparative data in the annual reports, provided a rational classification such as that of the English Board of Trade were specified. If, however, the requirements as to the form of station reports were modeled after those in use in Massachusetts, little or no professional service would be rendered, the only effect being to point out general weakness without giving a clue as to the underlying causes. With a proper classification, however, managers would be given valuable assistance in determining, by comparison with other stations, in what directions improvements are possible, and be provided also with means to satisfy the public in case of dispute as to prices, instead of, as at present, having no data to meet demands based upon the cheapest rate paid elsewhere for lighting, regardless of the conditions favoring the low price.

Stock Jobbing.

A most Mephistophelian iniquity, says the London *Electrical Review*, seems to have gotten hold upon engineers and quasi-engineers of late years. No matter how paltry the idea, every self-styled inventor of some new arrangement of furnace, smoke device, or other appliance seems to feel justified in appealing to the public to relieve him of the child of his brain, and the price to the public has steadily gone up. A few short years ago a quarter of a million sterling was looked upon as a big sum to ask. The inventor would get an eighth or so and the syndicate five-eighths, while the shareholders got a quarter as working capital. The provision of working capital is a grand idea. It keeps the thing going, pays cab fares, and finds a steady stream of fees for directors for some time, and enables the concern to go down hill so gradually that by the time the collapse has come about most original shareholders have cleared out and only a few—parsons and old maids—of the original holders bear the brunt of the whole drop from £1 to zero. Emboldened by the successes in the past and encouraged by dreams of wealth to come, a modest quarter million is scouted to-day and half a million or more is asked. A man who sells an addled egg for a shilling cheats the purchaser out of a shilling, it is true, whereas if the egg were sound he would be selling value, but even a sound egg is only worth a penny or so as an egg, though it may be treated in a way to become a chicken. There is a marked difference between patents for mere variations in mechanical apparatus, and patents for new processes such as the Bessemer steel process, which introduce entirely fresh methods and create new industries. Yet these creators of a variation in detail want to make in one or two years more money than the Bessemer patent made in many years. The whole business of company flotation is exceedingly deplorable, and is apparently leading up simply to the booming of a device for a period of a year, the expenditure of money for testing purposes and a general flare-up so as to get the thing on to the public while the boom lasts. After that the deluge.

The Early History of the Polyphase Motor.

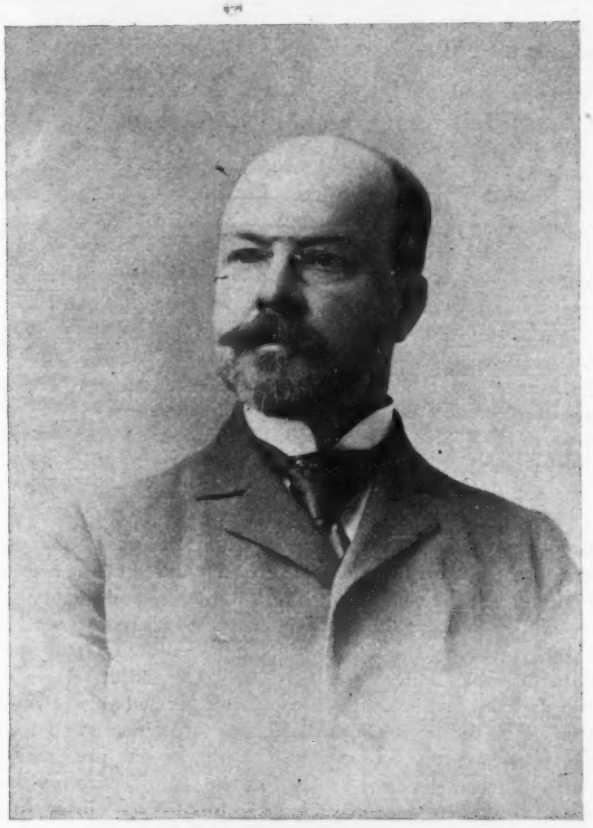
In the columns of the London *Electrical Review*, Rankin Kennedy says that Prof. Thompson, having unearthed an early type of induction motor, made by one Bailey, has drawn forth some discussion on the subject. Mr. G. Giorgi, of Rome, claims an early date for Paccinotti as the inventor of the polyphase motor. In that, however, he is wrong, for as Prof. Thompson points out, Paccinotti did not work with *induced* currents, which is the essential feature of the induction motor. Paccinotti worked with shifting poles—a principle of working first introduced in 1849 by Wheatstone, as quoted by Prof. Thompson. It is necessary to draw a broad line of distinction between rotary polar motors and induction motors, and also between the two classes of induction motors, polyphase and single phase. Bailey's is certainly the first polyphase induction motor yet discovered; in every respect it works exactly as the very latest two-phase induction motor. As a two-phase induction motor Walter Bailey's would be self-starting, but it would also work as a single phase motor if the disc were first set in motion and an alternating current sent into one pair of magnets.

Death of George M. Phelps.

The news that Mr. George M. Phelps had died of pneumonia on April 11, after a short illness, was a great shock to an unusually extended circle of friends and acquaintances. Few men in the electrical field were more widely known than was Mr. Phelps, and few were held in higher personal esteem by those who had experienced the charm of his warmly sympathetic nature and the influence of his generous social qualities.

The suddenness of the sad event was startling to those who had known Mr. Phelps intimately. He died in harness, for he was at his desk in the office and apparently in good health until the day before he became ill. Music was one of his greatest pleasures, and he attended a concert on the last evening he was outside the house he was borne forth on the way to his last resting place.

The brief time that elapsed before the end came may be realized from the fact that the day the illness began was the one on which in the ordinary course most of the pages for last week's issue of THE ELECTRICAL WORLD were prepared for press. At 8 o'clock in the evening of the day that edition was dated the friends and



GEORGE M. PHELPS.

neighbors of Mr. Phelps gathered to pay their last tribute of respect to his memory, and on the following morning—bright Easter Sunday—the casket containing his remains was taken to the home of his childhood and laid away forever in the family burying plot.

At the funeral the minister expressed the opinion that the wish of Mr. Phelps would probably have been that when his time came he should die comparatively suddenly and in the prime of life and vigor and usefulness, rather than in his old age, after a lingering illness. This is undoubtedly true. As a matter of fact the domestic and social side of the genial gentleman's nature was so highly developed that he must have felt pathetically forlorn since the death of his wife, which occurred but a short time ago, and of his mother, which took place recently. His own death seems to have been the culmination of a series of bereavements in his family within the past year which would have saddened a man of much less delicate sensibilities. Mr. Phelps leaves one child, a daughter, who is married. After the death of his wife he gave up housekeeping, and boarded in a hotel in Brooklyn, but lately lived with his sister.

When once enlisted in any cause, and particularly in those of a social character, George Phelps, as he was familiarly called, spared no effort in its advocacy, and hesitated at no personal sacrifice to insure its success. It was through his efforts that the New York Electric Club was maintained in existence long after it would otherwise have been discontinued, and the American Institute of Electrical Engineers also benefited from the unremitting interest he took in its welfare.

With a strong human interest in everything coming within the scope of his daily life, Mr. Phelps was one of the natures that make the world brighter. Many will miss his hearty greeting and the inspiration of his amiable presence.

George May Phelps was born fifty-two years ago at Troy, N. Y., and was educated at the public schools and high school of that city. His father was the well-known electrical inventor, G. M. Phelps, who invented the Phelps ticker, Phelps telephone, etc., the patents of which were acquired by the Western Union Telegraph Company, and many of whose inventions are still used by that company.

From 1861 until his death, with the exception of an interval of five years, Mr. Phelps was continuously engaged in electrical pursuits. His first position was in the shop of the American Telegraph Company, of which his father was superintendent from the organization of the company until its absorption by the Western Union in 1866. From 1863 until 1866 he served in the auditing department of the American Telegraph Company. From 1871 until 1879 he was his father's assistant in the conduct of the Western Union Company's factory in New York. When in April of the latter year that company gave up its own manufacturing and disposed of that branch of its business to the Western Electric Company, he was appointed superintendent of the factory by the latter company, which position he held until December, 1885.

Early in 1886 Mr. Phelps joined Mr. Franklin L. Pope in conducting the *Electrician and Electrical Engineer*, then published monthly, and acquired a proprietary interest in that journal soon after. When *The Electrical Engineer* was made a weekly and its business incorporated he became president of the company, and latterly added the duties of business manager.

He was a charter member of the American Institute of Electrical Engineers, and was elected one of its managers on May 19, 1885, in which capacity he served on the council until his election as treasurer on May 17, 1887; to this office he was re-elected each year, and at the time of his decease he was the council nominee for the same office for the term beginning May 14, 1895.

Mr. Phelps was for many years before his death a member of the Hamilton Club of Brooklyn and of the Reform Club of New York.

Electricity Before the New York State Legislature.

Legislation affecting electrical matters is somewhat slow this session. Possibly the hard times may have something to do with it, but certainly there is a notable lack of that vigorous demand for franchises and rights of way that characterized the session of 1894. The trend seems rather to be toward securing and perfecting the privileges already granted, and it is somewhat to be doubted if in the end much new legislation goes through.

But one demand for the establishment of a power plant has been made, and that is a renewal of the old "Genesee River Dam" scheme. It was supposed last year that the people of Rochester would decide to build the dam at Mt. Morris themselves and get the profit out of whatever power might be developed, but they seem to think that political influence will in time prevail to have that part of the work done by the State. This bill has passed the Senate and is soon to be brought up for passage by the Assembly. There is a rumor that the construction of the proposed dam by the State at a cost of hundreds of thousands of dollars was a part of a political deal made with certain Rochester politicians prior to the election last fall. Such being the case, it is just possible that the scheme may go through.

There have been no applications whatever for legislation to create electrical cities, such as Waddington, in St. Lawrence County, for instance, was to be. But there has been any amount of legislation proposed to regulate electrical matters in cities that actually exist. Very few divisions of electrical business have escaped the proposed intrusion of the alert lawmakers. Railways, lighting, power, telephone and telegraph plants, all have more or less legislation aimed at them. Out of the numerous trolley accidents, augmented by the strike in Brooklyn, have come demands for laws requiring better informed operatives on the cars, the equipment of all cars with proper fenders, and specific regulations as to speed. One bill provides that every motorman shall be first instructed at the power house as to the nature of the force he is to handle, then placed on a car with an instructor, and until fully capable shall run only on lines that are least traveled. He is also to be a strictly temperate man. Another provides for the licensing in Brooklyn by the Police

Commissioners of motormen and other similar employees, and prohibits policemen from conversing with them while on duty, except for purposes of caution. A measure having a similar purpose provides that the licensing shall be done in New York and Brooklyn by the steam boiler inspectors, who are to employ an electrical expert to do the examining. Inspectors are also to be employed by the cities to see that the trolley cars conform to this and other laws to govern them. It is proposed to secure the immediate adoption of fenders by having the Railroad Commissioners give an open competitive trial at once of the various inventions in the market. They are to select that which will "give the greatest security to life and the least possible injury to persons coming in contact with electric and cable cars while in motion." Street railways must then adopt the same "and shall not be permitted to operate without such fender." The proposed speed regulations provide for six miles an hour in busy sections, and not over eight miles per hour anywhere. It is to be noted in passing that these bills were all introduced early in the session, but are yet kept in the committees. They are not likely to be enacted into laws. A similar fate awaits the bill making a uniform $2 a day rate of wages for electric car employees, and that requiring all car platforms to be enclosed.

By far the most significant bill bearing on the electric railways, however, is that which is being pushed by Senator Stapleton, of Syracuse, and which if it becomes a law will enable those corporations all over the State to go into the business of furnishing power and light. This has been vigorously fought up to date and may be defeated. As it now stands, the measure applies only to places of less than 5,000 population, but it is asserted that this is only an opening wedge. The various power and lighting companies are up in arms against the bill even in its present form. It is also opposed by the interests that want the legislation asked for by another measure providing for an amendment to the law that allows a village to condemn a lighting plant in order to acquire it. The amendment strikes out the words giving the power of condemnation, and simply allows the president and trustees of a village to act. Another bill now a law exempts Richmond and Queens counties and the village of White Plains in Westchester county from the statute authorizing village trustees to contract for electric lighting. Several such measures as those just referred to are now awaiting action and their fate is uncertain. A bill fixing the price per hour to be charged for an incandescent light at one-half cent and for each arc light at not over four cents is buried in committee.

Several measures have appeared which provide for the inspection of electric meters, for the general government of electric light companies as railways are now governed by commissioners, and for establishing the qualifications of all persons installing or handling electrical apparatus of any form. Possibly the inspector of meters will be established, but the bill is not yet perfected. The object is to create an office and make the electric light companies pay for it. There is a bill creating a State gas and electric light commission, but it is practically dead. About the same may be said of the measure providing for an examining board in each judicial district, to consist of four persons, who are to pass on the qualifications of all electrical workers and issue licenses to them. A bill which has the same fate before it, apparently, empowers electric light, heat and power companies to make and sell artificial ice or carry on a cold storage business.

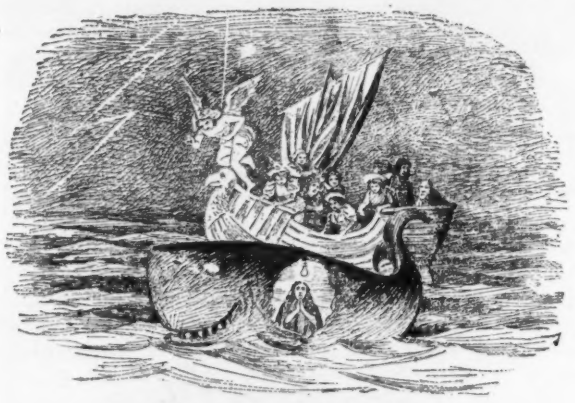
The old familiar attempts to reduce telephone and telegraph rates are not missing this session. The telephone rate bill appeared in the same form as last year, but has been much amended by its introducers, particularly in the way of raising the flat rates fixed, and is now in an uncertain condition. One telegraph bill proposed to reduce the rate to 15 cents for 10 words, with a half cent for each extra word thereafter, and to make the same rate for night messages of 20 words. It will not be heard from, nor will its associate, which made the rates from 7 a. m. to 7 p. m. 20 words for 10 cents and 1 cent per additional word, while night messages were to be 10 cents for 10 words and a half cent for each additional word.

A number of bills affecting electrical interests in various ways also appear on the files. One provides that all the elevated railway cars must be lighted either with electricity or gas after June 1, and another restricts the lighting solely to electricity, while both provide dire penalties for failure to comply with their requirements. One prohibits the employment of a railway telegrapher under 18 years of age and of at least one year's previous experience. One gives to electric light companies the same rights of condemnation to secure right of way as telegraph companies have. Another, which has become a law, gives the Canandaigua Electric Light & Railway Company the right to take condemnation proceedings. Another fixes a heavy fine for revealing any telegraph or telephone message, or for attempting to secure knowledge of the same. The latest to appear creates the Mayor and the Subway Commissioners of Brooklyn a board of electrical control whose duty it is to put all wires under ground in that city and pass on all extensions of present lines. Very few of these bills have escaped the committees and very few are likely to do so.

Antiquity of the Incandescent Lamp.

One of the most interesting sights of New York is a performance at one of the Jewish theatres on the Bowery, there being several near Canal street patronized exclusively by Russian Hebrews, in which the plays are produced in the Jewish-German-Russian jargon with a mediæval crudity. Each theatre has its own playright who, however, owing to the fondness of the audience for realistic scenes, has to divide the honors of the reproduction with the important personage who creates the realistic accessories.

How important the functions of the latter are will be evident from the following description and illustration, taken from last Sunday's *Herald*, of a scene from a play entitled "Jonah," now being produced at the Old Bowery Theatre. "After Jonah has been thrown



Jonah in the Whale.

overboard, for a moment," says the reporter, "it appears that nothing can save him. But just as he is sinking for the last time a great fish comes along, shaped something like a flounder, and deporting itself like a ball of rubber; it opens a very wide mouth and Jonah climbs in. Instantly the ship, which has been hammering the stage boards in its wild tossing, becomes still. The ballet sailors on the deck set up a jubilant chorus, and a gauze dressed angel drops down from the flies, while the fish—who has disappeared behind the scenes—turns about and re-enters with a new side presented to the audience. This new side is as open as the day. Through an oval window in the whale's larboard quarter Jonah is disclosed sitting in great splendor of red and green, with soft lights, and not a suggestion of discomfort." The anachronism of the incandescent lamp probably did not appeal to the enthusiastic audience.

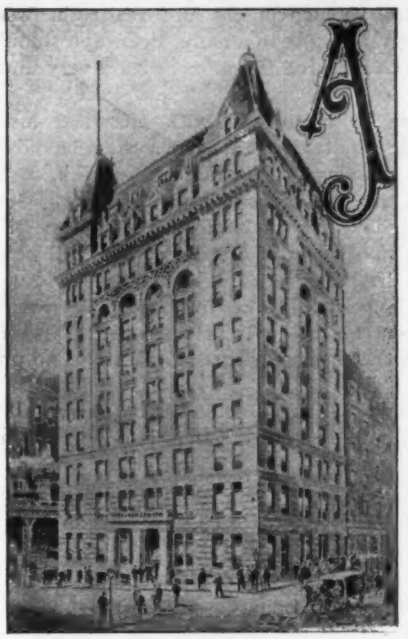
Electricity Extraordinary.

The newspaper press is circulating a wonderful tale concerning a Chicago hotel which, it is gravely stated, is "heavily charged with electricity." The story runs that when one guest started to shave himself a huge spark leaped from the razor and startled him to such an extent that involuntary suicide nearly resulted. We are further informed that another guest stepped into a bathtub and immediately howled lustily for assistance, being assailed with a sensation of having thousands of needles unceremoniously jabbed into his person. The employes of the hotel broke open the door and rescued the victim who, however, is said to have experienced no bad effects from his marvelous bath. The tale concludes with the statement that the hotel is losing patronage, and will probably be pulled down!

Telegraph Tariffs in Turkey.

A uniform tariff for telegrams in the Turkish Empire has been drawn up by a specially appointed commission in Constantinople. The project has been submitted to the Turkish Posts and Telegraphs Department.

An Office Building Lighting Plant.



A FEW years ago the electric light equipment of office and other large buildings was more frequently than otherwise carried out in a haphazard manner, particularly with respect to the distribution; and even in recent buildings there may be found evidences of poor design and crude workmanship. In one of the most pretentious of the office buildings lately erected in New York, for instance, the risers are encased in common wooden moulding in the runways, the moulding being disposed in a number of layers, and each layer nailed to the one immediately beneath it. A good example of the opposite class of work is to be found in the electrical equipment recently installed in the fine new twelve-story building of the Fidelity and Casualty Company, located at the corner of Cedar and Church streets, New York. Here we find evidence on every hand of careful design, while the generating plant and distribution system are of the most modern character, including direct connected machinery and iron armored conduit.

The generating plant consists of two General Electric multipolar machines, each of 25 kw capacity, direct connected to Ames engines, as shown in Fig. 1. The engines are 10x10 inches, of the simple non-condensing automatic type, and rated at 50 horse power at an initial pressure of 80 pounds and a back pressure of five pounds when running at 300 revolutions per minute and cutting off

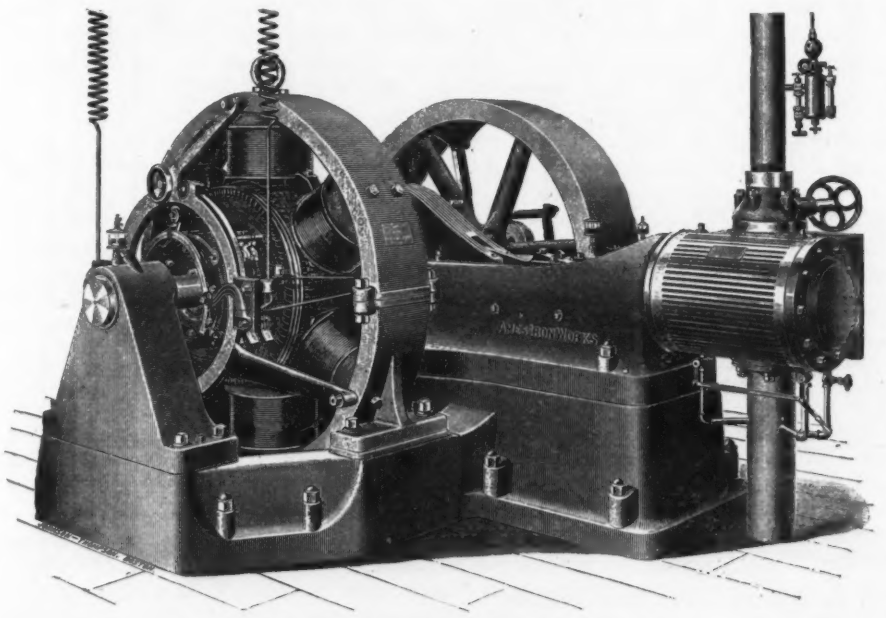


FIG. 1.—DIRECT CONNECTED GENERATING SET

at one-fourth stroke. While the normal working steam pressure is placed at 80 pounds, the engines are designed to work safely at a cylinder pressure of 125 pounds should it become desirable. The shaft and crank are forged in a single piece, and the shaft is extended at one end, the dynamo armature being mounted directly upon the extension, thus obviating an intermediate coupling.

Each dynamo stands upon a common base with its engine, insuring the preservation of alignment between the frame of the dynamo and that of the engine. The dynamos are wound for 110-125 volts and compounded for three per cent. drop; the heating limit is placed at 70 degrees F. above the surrounding atmosphere during a ten-hour continuous run under full load, and the dynamos are capable of carrying a 20 per cent. overload.

The switchboard is of polished white Italian marble mounted in a substantial iron frame, and rests upon a brick pier extending along its full length. This pier is faced with white marble tiling to correspond with the switchboard. By reference to the floor plan of the dynamo room, shown in Fig. 2, it will be noticed that the

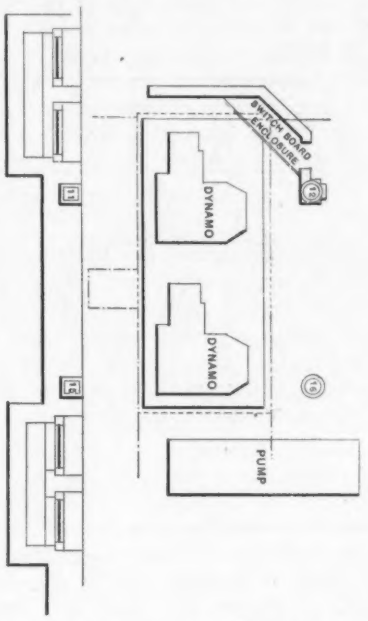


FIG. 2.—FLOOR PLAN OF DYNAMO ROOM.

board is set in one corner of the room between one of the pillars and the wall, and that the conformation of the wall in the rear is most convenient, giving as it does a good sized passageway or working space back of the switchboard. The switchboard connections are shown diagrammatically by Fig. 4. The rheostats are mounted on the back of the board, in accordance with the latest practice, with handles and dials on the front. A differential voltmeter is provided for convenience in throwing the dynamos in parallel, the connections being such that when the machines are at equal voltage the voltmeter windings neutralize each other and the needle stands in the centre of the scale.

An automatic magnetic circuit breaker protects each generator from injury through excessive overload; the feeder switches are all quick break, the fuses are laid in hard rubber channels to avoid disfiguring the surface of the marble, and all the appointments are of the latest and most approved patterns.

The main switch is double throw, one side connecting the building circuits with the street mains and the other with the local generating plant. The building is wired on the three-wire plan and when supplied from the street mains the connections are so made. The neutral wire throughout is, however, equal in cross section to the sum of the positive and negative wires, and when the lights are operated from the house plant the neutral feeders are connected to one pole of the dynamos and the two outside wires to the other pole, forming a split two-wire system. The bus bars have a minimum cross section of 1,000 circular mils per ampere and the connections are given a contact surface of 1,500 circular mils per ampere of current.

From the switchboard a three-wire feeder, each wire of which is of 300,000 circular mils cross section, goes to a meter at the street service entrance, and five feeders run to the various distribution points in the house wiring. The cellar feeder is quite small, handling as it does only the few lights in the cellar. Feeder *A*, consisting of two No. 2 outside wires and a No. 00 neutral, supplies the lights on the first, second and third floors; feeder *B*, comprising two No. 3 wires and one No. 0, supplies those on the fourth, fifth and sixth floors; feeder *C* serves the seventh, eighth and ninth floors, and feeder *D* carries current to the tenth, eleventh and twelfth stories. The last two feeders are of the same cross section as feeder *A*.

At each floor an iron cut-out junction box is placed, containing a slate panel board similar to that shown in Fig. 4, from which two sub-feeders run to distributing wall pockets. The wiring is run in

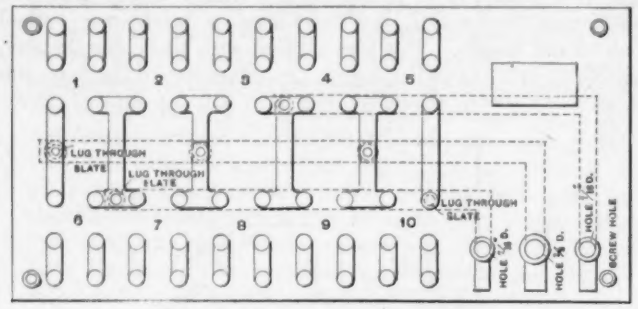


Fig. 3.—Slate Panel Board.

iron armored conduit throughout the building, one wire in a tube excepting the branch mains, which are "duplexed."

In addition to the electric light wiring the building is equipped with a complete system of telephone, telegraph and "ticker" circuits; comprising vertical "risers" from the cellar to the top floor, each pair of "risers" being provided on each floor with a brauch connection for taking off distributing circuits.

Patents for Electrical Inventions.

It is becoming a serious question at the present day whether the issuance of a United States patent confers any real right worth having, or whether it merely amounts to a mere license to indulge in the luxury of a long and expensive litigation with a very uncertain termination.

This is especially the case in connection with electrical inventions, and the objectionable results of the present system have been in the last few years very abundantly illustrated in relation to the electrical industry, though the present condition of affairs is eminently unsatisfactory throughout the whole of our patent system.

No one can foresee with any degree of certainty what will be the particular idiosyncracy of the judge who may have the deciding of a particular case, or how long it will take to obtain a decision, or whether or not the document he holds is so restricted in its scope by the state of the art that the rights conferred by it are of no practical or commercial value.

The impecunious man having a valid patent on an invention of possibly transcendent merit and enormous value is now practically at the mercy of a rich and unscrupulous corporation or individual, and it is notorious that if any person or body financially strong takes a fancy to appropriate the fruits of a patented invention, the patent laws of the United States exercise a very slight restraining influence in the matter. If the invention is worth taking it is

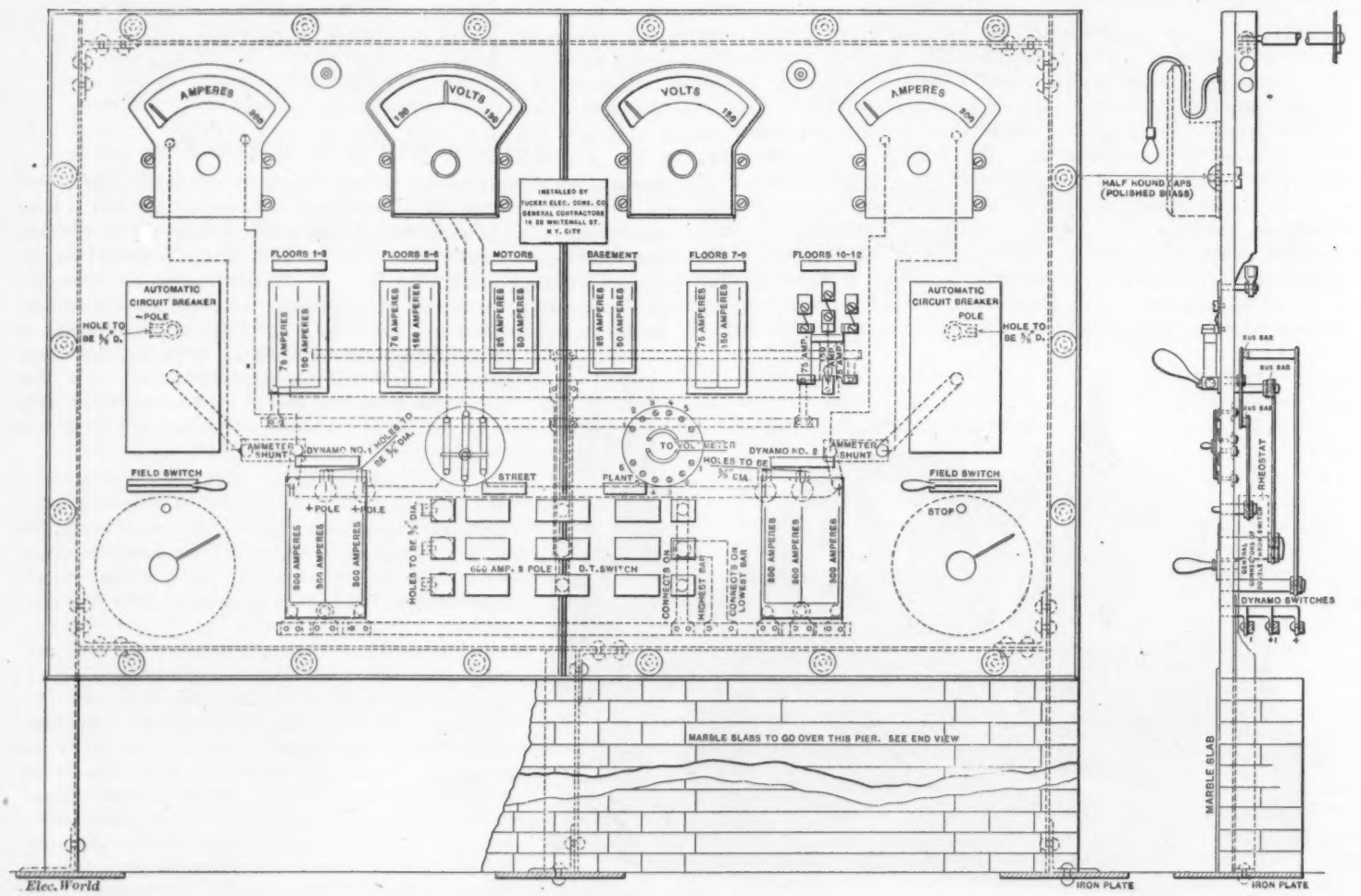


Fig. 4.—Switchboard Connections.

It is notable as indicating the character of the workmanshin that the first test after the completion of the wiring showed the entire system to be absolutely free from any trouble or defect. The plant was installed by the Tucker Electrical Construction Company under the supervision of Mr. H. A. Sinclair, to whom we are indebted for information concerning details.

Reorganization of the "Electrical Engineer."

It was announced on Monday that a reorganization of the *Electrical Engineer* corporation had been effected with the following officers: President, T. C. Martin; vice-president and treasurer, Joseph Wetzler; secretary and business manager, A. C. Shaw.

probably also worth the additional expense of counsel and experts to delay and oppose.

"*The courts are open.*" Are they? Yes, when the suitor has paid a considerable sum for court fees, several hundreds of dollars to counsel, the like to expert and other witnesses, notaries, stenographers, and for miscellaneous expenses, and, perhaps, a hundred or two dollars for printing, and when he comes in with his counsel, two or three printed volumes of testimony and his completed case after a lapse of from one to three years, then he draws near to the Circuit Court of the United States, and is heard, that is, if the case does not "go over until next term." When the case is heard, it may be before a learned and experienced Judge, it may be before another

who is at sea in mechanical or electrical subjects, and one whom the explanations of experts only bewilder. The court after hearing several hours of argument reserves its decision, and in a week or two or month or two or more files an opinion which, in all probability, only satisfies one side. Then, of course, the appropriate proceeding is to appeal to the higher court. In the days when appeals went to the Supreme Court of the United States, usually years in arrears with its work, the aggressor was safe for an indefinite period. Some amelioration was introduced by the establishment of the new Court of Appeals, but the delay in cases involving patents, and especially, perhaps, electrical patents, is still sufficiently serious to call for relief, if relief be possible.

The Patent Office, admirable as it is in many ways, is not in a position to issue some 20,000 patents a year and afford any satisfactory assurance or guarantee as to the degree of protection afforded by the grant. It has been hampered and rendered less efficient by the indifference of Congress for years, and it is that body which is principally to blame for defects in the issuance of patents. With proper facilities the Patent Office could approach much nearer to actuality in purporting to grant an inventor the exclusive right to manufacture, sell, and use an invention for a term of years—a grant which must at present be taken with a very important implied proviso.

Other circumstances are also responsible for the doubtful value of patents; among these are the fictitious worth in the eyes of the general public of the mere word, "Patented," regardless of the true value of the invention, and the consequent triviality of many inventions patented; then, again, many manufacturing corporations appear to regard the man whom they "hire" as an "inventor" or "electrician" in the light of a hen who is expected to lay so many "inventions" in the course of a year. As a result, many of these so-called inventions are the merest mechanical improvements of the most paltry nature. The ordinary stockholder, however, for whose benefit they are provided, is just as happy and parts with his money with the same eagerness as if they represented something of value.

The unprincipled horde of cheap patent "attorneys"—"no cure, no pay"—who will procure a patent on almost anything, are responsible for a very large number of utterly worthless patents. Usually they do not know, and do not care, whether the patent describes the true invention or not, and the client is almost as culpable—he wants a "cheap" patent, and he gets it; not until he wishes to protect himself by it against an infringer does he discover to what extent he has an "exclusive right." Only the general spread of education and common sense can be relied on to remedy this evil. To return, however, to what is, perhaps, on the whole, a more important trouble, the delay, expense and uncertainty of patent litigation, let us notice, briefly, some of the more noticeable instances Taking, for example, the case of the Edison incandescent lamp patent, it was not until after years of enormously expensive litigation that a final decision, if final it can be called, was reached, and now the electrical world is anxiously awaiting the decision of the United States Supreme Court upon a question, raised in an entirely distinct case, which will settle authoritatively whether or not that patent has really expired.*

The Thomson regulator patent of 1881, in deference to which thousands of dollars had been paid in tribute, has been recently held invalid, although previously sustained, and now we must wait for a decision of the appellate Court before knowing "for good" whether it is to be respected or not.

The Edison feeder and main patent has met with a like fate, and on similar grounds; it remains to be seen what will happen eventually to the three-wire patent, attributed in this country to Edison and in England to Hopkinson, when it shall be presented for decision, as no doubt it will be some time in the future.

The Brush double carbon patent and the Bell telephone patent cost years of time and very large sums of money to uphold.

Litigation of this character can only be maintained by the very wealthiest corporations, and it is hardly too much to say that the uncertainty, delay and excessive cost amount to a practical denial of justice in very many cases. Most undoubtedly the legitimate course and development of the business are seriously hampered and impeded.

To what is this condition of affairs due? In the first place, largely to the fact that it is practically necessary in patent suits to proceed in *equity* rather than at *law*, principally for the purpose of obtaining an *injunction* against the manufacture of the alleged infringing apparatus, as well as the recovery of profits and damages, and this involves the application in such cases of the old English chancery procedure, which, however well adapted to arrive eventually at the true merits of a question, is neither expeditious nor economical, even as modified by the appropriate rules of court.

Under these rules there is a very comfortable and convenient way of taking the testimony in such cases, viz: before a notary public at any convenient place, usually the office of one of the counsel, and these proceedings largely assume the aspect of a comfortable family party, with intermissions of conversation and good stories, watching a game of chess between counsel and the "expert witness." The method permits of frequent adjournments for the convenience of any one concerned, and is a very agreeable one to all but the unfortunate individual who has to "pay the piper." Rich corporations who can afford to indulge in such luxuries are, perhaps, not to be pitied, but to the man of moderate means it is a serious matter, so serious that he oftentimes prefers to put up with his loss rather than to embark upon the sea of litigation.

Moreover, the *onus* of deciding, practically without assistance, the facts, as well as the law, in matters involving possibly delicate scientific or mechanical questions, is too serious a one to be placed on the shoulders of an individual judge devoid of special technical training, and also charged with the duty of dealing with the other mass of litigation coming before a Federal tribunal. Such a judge is practically without assistance of a technical character, as the opinions of expert witnesses employed by the respective parties must from the nature of things be more or less biased, even though unconsciously and with no intention to mislead. If the court were able to hear only one side, a conclusion could be much more readily reached, but that plan also is open to objection. Such a judge occupies the position of Captain Macheath, and is unable to eliminate for himself the factor of bias from the substratum of scientific truth.

Another cause of the delay in patent cases is the fact that except in the case of an application for an injunction on a patent already sustained, and where infringement is clear, there is no prompt intermediate proceeding readily available for the decision of some comparatively simple question of fact which might dispose of the whole case. It is true that there is a provision in the Act of 1875, for referring questions of fact to a jury, but the fact that this proceeding is so seldom employed indicates that it fails in some way to satisfactorily meet the requirements of the case. As the law now stands the decision of all questions, except as above stated, practically has to await the final hearing of the case, at which time possibly the larger portion of the testimony is useless, the patent, perhaps, being held invalid on, for instance, the ground of "prior publication," the merits of the invention, and other defences not being considered at all. If there were some expeditious interlocutory proceeding by which such questions could be disposed of there seems little doubt but that a mass of protracted litigation could be avoided. It may be well to remember the principal grounds of defence to a suit for infringement of a patent:

1. Non-infringement.
2. Prior patent or publication.
3. Public use for more than two years prior to the application for a patent.
4. Absence of the quality of "invention."
5. Abandonment of the invention to the public.
6. *Laches.*
7. Patentee not the original and first inventor.
8. Fraud.

Now, it seems evident that certain of these defences, several of which are usually set up in the answer, may be entirely unnecessary in the final decision of the case, which may hinge, for example, on the point whether a prior description did or did not anticipate the invention in question. It is quite conceivable that that question may be capable of easy and prompt decision; under the present system, however, it awaits final hearing upon the whole testimony introduced in the suit, upon not only that point, but also upon all the other defences which may be raised. Is it not possible to discover some plan by which such "preliminary" defences can be satisfactorily disposed of at an early stage of the case? In many cases the exact extent and scope of the patent sued on would be agreed on by both sides, and the decision of such a question as, for example, that suggested above, might be readily dealt with by a judge "in chambers," assisted, if need be, upon technical questions

*Since the above was written the U. S. Supreme Court has decided that an invention patented abroad before the *issue* of the U. S. patent for it is entitled to protection only until the expiration of the foreign patent.

by independent expert "official assessors" appointed *pro hac vice* by the court. The system of "official assessors" is employed across the water with, it is understood, satisfactory results, and would relieve the court of a vast amount of labor and assist materially in the disposal of questions of a scientific or technical nature. Their duties need not end with the preliminary matters in case the suit is found to be such as must proceed to final hearing, but they could inform and advise the court at any stage of the proceedings. Their communications to the court could be as confidential as the deliberations of the members of a court consisting of a plurality of judges, and, in view of the suspicion of corruption which, unfortunately, attaches to almost every public official, it were better that this should be so.

Such official assessors would not be invested with any judicial character, but would merely act in an advisory capacity, and obviate the necessity for the education and instruction of the court in an unfamiliar art, a process which, under the present system, is imperfectly effected in a slow and expensive manner.

By some plan of the nature suggested the technical portion of the testimony could be "boiled down," and the essential portions only considered by the court, the assessors submitting their conclusions and advice, to receive such weight in formulating the decision as the court thinks they merit. Such an arrangement would involve no serious disruption of the present procedure, and would, it is believed, relieve litigants of much of the present uncertainty, delay and expense.

With regard to the issuance of patents, it can hardly be contended that more than a very small proportion of the enormous number turned out from the Patent Office represent really meritorious "inventions" of practical value to the community, a vast number covering trivial mechanical improvements or mere changes of an almost obvious nature. If primary examiners assumed an attitude of greater stringency in rejecting applications for want of the peculiar element of "invention," and for want of utility, the number of worthless patents might be largely curtailed without injustice to the meritorious inventor, as the right of appeal to the board of examiners, and so on, would still be available.

It is not advisable to "tinker" too much with our patent system, as the "granger" element is always waiting an opportunity to attack all patents, good, bad or indifferent, and capital has generally an ax to grind whenever the question of patents arises. The above suggestions, however, if carried out, would not, it would seem, injure any one, and at the same time would afford a certain measure of relief.

Electricity in Factories and Workshops.

Some important installations recently carried out in England and on the Continent afford excellent illustrations, says the London *Electrical Review*, of the varied uses to which electricity can be successfully and economically put in mills, workshops, factories, and similar establishments, more especially where large quantities of machinery require to be driven. At the extensive ribbon and silk manufactories of Messrs. James Forrest & Co., at St. Etienne, is one of the more interesting of recent electric driving installations carried out in France. The factories, which employ 500 people, contain 100 looms for weaving special articles, quadruple and sextuple plushes and ribbons, all of which are driven by electric motors. The spinning room machinery is likewise all driven electrically, as are also the winding machines for raw silk. It required a certain amount of confidence on the part of the owners of these factories to embark upon so extensive a scheme, and it was only after considerable hesitation, and weighing carefully and comparatively the various points for and against, that electricity was selected as the motive power for driving the many machines. The question of efficiency, loss incurred in transmission, and picturesque appearance, all told in favor of electricity when compared with the out-of date system of overhead shaftings, pulleys, etc., which absorb so much power, and also in so many factories present an appearance of inextricable confusion.

Electric Traction in France.

The municipal authorities of Lyons have voted in favor of the application of the Lyons Omnibus and Tramways Company for permission to convert the Lyons St. Fonsvénissieux tramway into an electric line. Plans have been prepared, and are at present receiving the consideration of the local authorities, for the construction of four lines of electric tramway in the town of Rennes.

Electrodynamic Machinery.—XXXII.

BY EDWIN J. HOUSTON AND A. E. KENNELLY.

176. In the operation of a dynamo-electric generator considerable difficulty is frequently experienced from the sparking which occurs at the commutator, that is to say, instead of the current being quietly carried off from the armature to the external circuit, a destructive arc which produces burning occurs between the ends of the brushes and the commutator. The tendency of this sparking, unless promptly checked, is to grow more and more marked from the mechanical irregularities produced by the pitting and uneven erosion of the commutator segments. It becomes, therefore, a matter of considerable practical importance to discuss the causes of sparking at the commutator, and the means which have been proposed and are in use to overcome the difficulty.

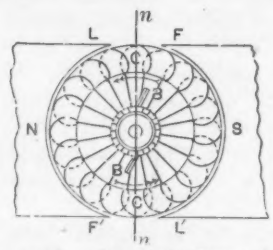


FIG. 145.—GRAMME-RING ARMATURE IN BIPOLAR FIELD ON OPEN CIRCUIT.

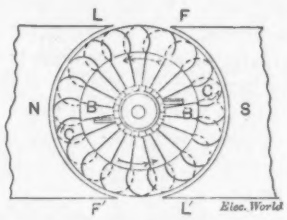


FIG. 146.—GRAMME-RING ARMATURE WITH BRUSHES DISPLACED FROM NEUTRAL LINE.

177. When a Gramme ring armature, such as that shown in Fig. 145, is rotated on open circuit in a uniform bipolar field, the brushes, if placed on the commutator, must be kept at points diametrically opposite corresponding to the line *n n*. If applied to the commutator at any other point, sparking would probably occur, although the armature is on open circuit. The reason for this is seen from an examination of the figure, which represents a pair of coils *C, C'*, about to undergo commutation; *i. e.*, about to be transferred by the rotation of the armature from one side of the armature to the other, and being short circuited by the brushes as they bridge over the adjacent segments of the commutator, to which their ends are connected. Since the coils *C, C'*, at the position shown, embrace the maximum amount of flux passing through the armature, there will be no E. M. F. induced in them, and, consequently, there will be no current set up during the time of short circuit under the brushes. In other words, the prime condition for non-sparking at the commutator is that the coils shall be short

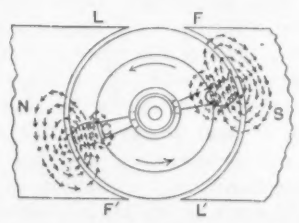


FIG. 147.—DIAGRAMMATIC REPRESENTATION OF FLUXIN MAGNETIC CIRCUIT OF SHORT-CIRCUITED COIL.

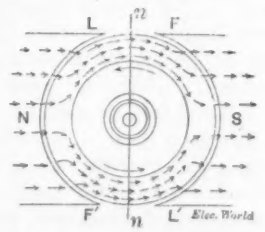


FIG. 149.—DIAGRAMMATIC REPRESENTATION OF FIELD FLUX PASSING THROUGH ARMATURE.

circuited only at the time and in the position where no E. M. Fs. are being generated in them.

178. If the brushes be advanced into a position such as that represented in Fig. 146, so that the diameter of commutation is shifted from *B B'* to a new position, powerful sparking will, probably, be set up, for the reason that in this position the rate of change in the flux linked with these coils is considerable, and, consequently, there is a considerable E. M. F. induced in them, so that when they are short circuited by the brushes heavy currents tend to be produced in the circuit of these coils according to Ohm's law. If, for example, a bipolar Gramme ring armature gives rise to a total useful flux of one megaweber, and there are 1,000 turns on the armature and 50 segments in the commutator, then, if the speed of rotation be 10 revolutions per second, the E. M. F. set up between the brushes will be

$$\frac{10 \times 1{,}000 \times 1{,}000{,}000}{100{,}000{,}000} = 100 \text{ volts},$$

and, since there are 25 commutator bars on each side of the diam-

eter of commutation, there will be an average of four volts per coil of 20 turns. If the resistance of each coil be 0.01 ohm, the current which tends to be set up in a short circuited coil having the average E. M. F. is

$$\frac{4}{0.01} = 400 \text{ amperes.}$$

179. It now remains to be explained how the existence of a powerful current in the short circuited coil will produce violent sparking at the commutator. It is well known that the presence of a spark indicates a higher E. M. F. than the four volts which we have assumed in this case to be generated in a short circuited coil. The increase in the voltage at the moment of sparking is due to the *inductance* of the coil.

At the moment of short circuiting the coil by the bridging of the

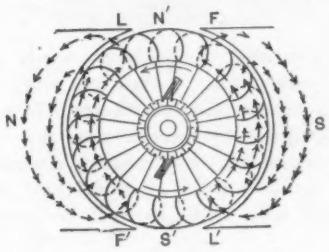


FIG. 148.—DIAGRAMMATIC REPRESENTATION OF MAGNETIC CIRCUIT OF ARMATURE.

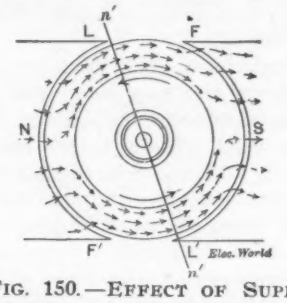


FIG. 150.—EFFECT OF SUPERPOSING ARMATURE FLUX ON FIELD FLUX.

brushes across the two adjacent commutator segments a powerful magnetic flux is set up in the coil, owing to its M. M. F This flux is so directed through the coil as to set up in it an E. M. F. which opposes the development of the current. On the cessation of the current, owing to the breaking of the coil's circuit at the commutator, the coil is rapidly emptied of flux, and a powerful E. M. F. is set up in the same direction as the current, sufficiently powerful to produce sparking between the brush and the edge of the segment it is leaving. The E. M. F. so generated during the filling or emptying of the loop by its own flux is called *the E. M. F. of self-induction.*

180. Fig. 147 diagrammatically represents the flux produced in the short circuited coils C, C', by the M. M. F. of the current produced during the short circuit. This flux passes principally through the air gap and neighboring pole face, a small portion passing through the air in the interior of the armature between the core and the shaft. The greater the flux produced by the coil the greater will be the E. M. F. developed in the coil, when the flux is suddenly withdrawn. The capability of a conducting loop or turn for producing E. M. F. by self-induction is called its *inductance*, and may be measured by the linkage of flux with the turn per ampere of the current it carries, that is, by the amount of flux passing through it.

181. We have thus far considered the coils C, C', as being composed of a single turn. If, however, each of these coils is composed of two turns, and the same current strength passses through each of these turns, then the M. M. F. of the coil will be doubled, and if the iron in the armature core and pole face is far from being saturated, the amount of flux passing through the two turns will be twice as great as that which previously passed through one. When this flux is introduced or removed, it will generate E. M. F. in both turns, and, consequently, will induce twice as much E. M. F. in the two turns together as in a single turn. The inductance of the coil, or its capacity for developing E. M. F. by self-induction, is thus four times as great with two turns as with one, because there is double the amount of flux, and double the number of turns receiving that flux.

182. It is evident, therefore, that the inductance of a coil increases rapidly with the number of its turns, although not quite proportionally to the square of the number, since, with a large number of turns, although the M. M. F. is increased in proportion to the number, yet the amount of flux passing through each of the turns, owing to leakage, is not the same. The E. M. F. of self-induction generated in each coil depends:

(1). First upon the E. M. F. induced in it by the revolution of the armature.

(2). Upon the resistance of the coil or its capability for allowing a large current to flow through it.

(3). Upon its inductance or capability for permitting that current to induce a powerful E. M. F. when the circuit is made or broken.

The E. M. F. induced on making the circuit at the commutator is advantageous, since it checks the development of the current; that on breaking the circuit is harmful, since it enables a spark to follow the brush.

If, therefore, no sparking is to occur in a dynamo-electric machine at no load, the brushes must rest on segments connected with coils in which no E. M. F. is being generated.

183. If the external circuit of the armature be closed through a resistance, so that current flows through the armature coils and brushes into the external circuit, the former conditions become considerably modified.

Fig. 148 represents the condition of affairs in which a current is flowing through the armature coils and the brushes are resting on the commutator with the diameter of commutation at the neutral points, or in a plane at right angles to the polar axis.

In this figure the direction of the armature rotation is the same as shown in previous figures, namely, counter-clockwise. Here the flux produced by the M. M. F. of the armature coils takes place in the circuits diagrammatically indicated by the curved arrows. The magnetization, therefore, produced by the current circulating in the armature turns is a *cross magnetization*, or a magnetization which is at right angles to the magnetization set up by the field flux. The field flux through the poles and armature is diagrammatically indicated in Fig. 149, where the north pole is assumed to be situated at the left hand side of the figure, and the average direction of the field flux is at right angles to the average direction of the armature flux. An inspection of Figs. 148 and 149 will show that at the *leading edges of the pole piece*, L, L', that is, at the edges of the pole piece, which the armature is approaching, the direction of the flux produced by the armature is opposite to that of the flux produced by the field, and that, consequently, the effect of superposing these fluxes is to weaken the flux at the leading edge as is shown in Fig. 150. On the contrary, at the following edges F' and F, of the pole piece, the direction of the armature flux coincides with the direction of the field flux, and the superposition of these two fluxes will have the effect of intensifying the flux at the following edges. Consequently, the *neutral line* in the armature, or a line symmetrically disposed as regards the entering and leaving flux, will no longer occupy the position N, N, at right angles to the polar axis, but will occupy a position N, N'; therefore, in order to set the brushes so that they may rest upon commutator segments connected with coils having no E. M. F. generated in them, it is necessary to bring the diameter of commutation into coincidence with the neutral line, or to give the brushes a *lead; i. e.*, a motion forward in the direction in which the armature is rotating.

184 This, however, will not in itself, as a rule, prevent sparking, for the reason that induced E. M. Fs. are produced in the coil under commutation at load, even although the coil being commuted has no E. M. F. set up by rotation. This E. M. F. is due to the inductance of the coil and to the load current that it carries. An inspection of Fig. 151 will show that as the coil C approaches the

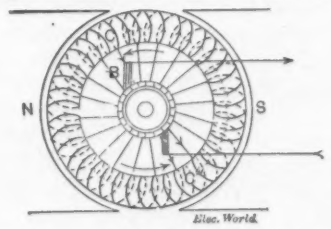


FIG. 151 —REVERSAL OF CURRENT IN ARMATURE COILS DURING COMMUTATION.

brush B the current in the coil, as shown by the arrows, is directed upward on the side facing the observer, while on leaving the brush after having undergone commutation, the current in the coil will be flowing in the opposite direction or downward. The sudden reversal of the current in the coil under commutation produces a sudden reversal of the magnetic flux linked with the local magnetic circuit of that coil, and this sudden change in the magnetic flux through the coil induces in it a powerful E. M. F., causing a spark to follow the brush.

In order that no spark shall be produced from this cause, it is necessary that before the brush leaves the segments the current in the coil shall have become reversed, and will, therefore, be flowing in the same direction as that which will pass through it during its passage before the pole face N. In order to effect this, it is necessary to bring the coil that is being commutated into a field of sufficient intensity to induce in it, while short circuited, a current

strength equal and opposite to that which passes when it first becomes short circuited by the brush. It is not, therefore, usually possible to keep the brushes on the neutral line as shown in Fig. 150 at n' n', but their lead must be increased, until the coil under commutation is in a sufficiently powerful field beneath the pole face to produce or nearly produce this reversal of current. The amount of lead necessary to give to the brushes in order to effect this will depend upon the inductance of the coils and also on the strength of the current in the armature.

185. The conditions which favor marked sparking at the commutator of a generator are, therefore, as follows; namely,

(1). A powerful current in the armature; *i. e.*, the sparking increases with the load.

(2). A large number of turns in each coil connected to the commutator; *i e.*, sparking increases with the inductance.

(3). A great distortion of the neutral line through the armature, or a powerful armature reaction.

(4). A high speed of rotation of the armature, since the current in the coil has less time in which to be reversed during the period of short circuiting.

The conditions which favor quiet commutation, or the absence of sparking, are as follows; namely,

(1). A small number of turns in each commuted coil or a large number of commutator bars.

(2). Decrease of current strength through the armature.

(3). A lead of the brushes.

(4). A powerful field or a high magnetic intensity in the entrefer due to the M. M. F. of the field magnets.

Gas Batteries.—II.

BY C. J. REED.

While the experiment described in The Electrical World of April 6 does not prove conclusively that there is no combination of oxygen and hydrogen in the presence of ordinary platinum electrodes, it shows that if such a reaction takes place it requires a more exact experiment to prove it. Such an experiment is now in progress.

Experiment II.—*Electrolytic oxygen and hydrogen with electrodes of platinum foil.* The object of this experiment was to determine the effect of electrolytic oxygen and hydrogen in a cell similar to that shown in Fig. 1, but used as an accumulator instead of a primary battery. The wires, C and C', were, therefore, dispensed with and an electric current of one ampere was passed through the platinum foils until the hydrogen depressed the surface of the solution to a point 10 mm above the bottom of the foil; the volume of oxygen formed being about half that amount. In other respects, the form and dimensions of the apparatus, strength of the solution and all conditions of the experiment were as nearly as possible like those of Experiment I.

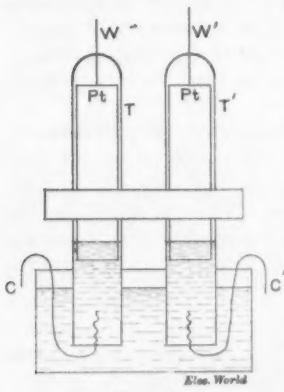


Fig. 1.

The circuit was closed through a Weston voltmeter (resistance 356 ohms) and the following observations were recorded:

Time.	Volts.
0	.75
10 sec.	.04
20 "	.035
1 min.	.025
2 "	.02
3 "	.015
4 "	.011
6 "	.007
10 "	.006
15 "	005
20 "	.004
25 "	.003
30 "	002
35 "	.001
40 "	.001
45 "	.001
50 "	.001
60 "	.001
70 "	.001
100 "	.001
6 hours.	.0005 (?)

At the end of 40 minutes the circuit was opened and quickly closed. There was a throw of the needle of .10 volt, falling rapidly to .001. At the end of six hours, on opening the circuit about five seconds and closing again, there was a throw of the needle of half a scale division, returning instantly to zero or less than .0005; showing that the cell had arrived at the same condition as in Experiment I. That is, the electrolytic product, whatever it may have been, was consumed and the cell was acting no longer as an accumulator. The experiment was, therefore, discontinued at this point.

The experiment shows that the action in this case is undoubtedly that of a galvanic cell during at least half an hour. The energy evolved was due either to the combination of ozone or hydrogen peroxide with hydrogen, or else to some reversible change in the platinum foil produced by electrolysis, and not to the combination of ordinary oxygen and hydrogen.

The total output of the cell up to the time when it had returned to the permanent condition, similar to that of the cell in Experiment I., could hardly have exceeded .052 ampere second and could not have consumed more than 5.4×10^{-7} gramme (.0065 cc) of hydrogen.

Experiment III.—*Hydrogen from zinc, atmospheric air and electrodes of platinum foil.* The apparatus and conditions were the same as those of Experiment II., except that no electrolytic gases were used. The hydrogen was obtained by treating pure zinc with dilute sulphuric acid and purifying the gas by thoroughly washing it, first with argentic nitrate to remove traces of hydric sulphide and lower oxides of sulphur, then with sodic hydrate to remove traces of nitric acid.

Twelve cubic centimetres of this hydrogen was admitted by displacement into the hydrogen tube and an equal amount of air into the other tube. The solution, as in the other experiments, was dilute sulphuric acid of specific gravity 1.125.

On closing the circuit through the voltmeter (resistance 356 ohms), there was a throw of the needle indicating nearly .02 volt, but returning instantly to zero. On opening the circuit five seconds and closing again the same deflection was obtained. This was repeated a great many times, and there appeared to be no difference between the action of the chemically prepared hydrogen on atmospheric air and that of heated electrolytic hydrogen upon heated electrolytic oxygen.

The cell was short circuited and allowed to stand for eight days. At the end of this time the hydrogen appeared to have diminished about .075 cc. This corresponds to a steady current during the eight days of 8.75×10^{-7} ampere and an electromotive force on short circuit (about 6 ohms) of 5×10^{-6} volt.

Admitting that in this experiment there was a loss of .075 cc of hydrogen in eight days and that this loss may have been due to voltaic combustion, there is still no certainty that it was due to combustion of oxygen and hydrogen; since in this case there were present both nitrogen and oxygen. There is no reason to believe that nitrogen and hydrogen would be less likely to undergo cold combustion than oxygen and hydrogen, especially since it has been shown by W. E. Donkin (see Proc. Roy. Soc XXI., 281) that nitrogen and hydrogen combine directly under the influence of the silent electric discharge.

Experiment IV.—*Electrolytic oxygen and hydrogen with electrodes of platinum foil and platinum black.* The apparatus was identical in size and construction with that shown in Fig. 1 in all respects, except that the foil was covered with platinum black. This was done by electroplating the foil with zinc and immersing them in a solution of platinic chloride containing an excess of hydrochloric acid. About 10 milligrammes of platinum black were deposited upon each foil. This was done after the electrodes were sealed into the tubes and the platinum black was formed also on the leading-in wires. The tubes were filled with dilute sulphuric acid of specific gravity 1.125 and inverted in a beaker of the same solution. They were then filled with electrolytic gases by means of extra wires, C and C', exactly as in Experiment I. The apparatus was then heated as in Experiment I. to destroy ozone and hydrogen peroxide.

After cooling the cell was short circuited and allowed to stand.

At the end of five hours the hydrogen had diminished to such an extent that the solution had risen to the top of the platinum foil. The oxygen had also diminished by about half that volume. There remained in the hydrogen tube about one cc of hydrogen above the platinum foil and in contact with the leading-in wire. At the end of four days all the hydrogen had disappeared except a small bubble estimated to contain about 40 cubic millimetres. At the end of seven days the bubble appeared to be no smaller and it was considered to be nitrogen. Without removing this bubble the tubes were re-filled as before and left on short circuit. In five hours the hydrogen had again receded to the top of the platinum foil and

in four days had all disappeared except a bubble now estimated to contain about 80-100 cubic millimetres.

The tubes were again re-filled and short circuited. The hydrogen again receded to the top of the foil in above five hours. But after seven days there was still left a bubble containing more than 0.1 cc. The tubes were filled once more, and again the hydrogen receded to the top of the foil in about five hours, and after three weeks there remained a large residual bubble of the gas. The apparatus was now emptied and re-filled with new solution, then filled with the gases as before; the gases extending this time within two millimetres of the bottom of the platinum foils. The level of the solution in the tubes was one inch higher than the level of the solution in the beaker. The circuit was then closed through the voltmeter of 356 ohms resistance and the cell allowed to stand. The following observations were recorded:

Time.	Volts.
0 sec.	.85
10 "	.60
1 min.	.51
2 "	.50
3 "	.50
4 "	.50
5 "	.50
6 "	.50
15 "	.498
45 "	.498
55 "	.495
105 "	.492
145 "	.486

At this point the tubes were slightly shaken and the electromotive force rose to .50 volt. The tubes were then lifted up two inches, bringing the level of the solution inside of the hydrogen tube three inches above the level of the solution outside of the tube. This caused the electromotive force to fall rapidly to .48 volt. On pushing the tubes down again to the original height the electromotive force instantly rose to .52 volt.

After fifteen minutes the tubes were again raised and the electromotive force fell to .484 volt. On lowering the tubes again the electromotive force rose to .53 volt. In raising the tubes up they were brought into a vertical position. In pushing them it was necessary to incline them at an angle of about 30 degrees from the horizontal. In the latter position there was probably a larger surface of foil exposed to the gas. This may account for part of the increase in electromotive force, but it must have been due largely to the difference in pressure, a result naturally to be expected.

The solution was then diluted with five per cent of water and the tubes again raised. The electromotive force fell rapidly to .46 volt and in fifteen minutes to .455. The circuit was now (180 minutes after the beginning of the experiment) opened and left open half an hour. It was then closed and the following observations recorded:

Time.	Volts.
0 sec	.85
10 "	.50
5 min.	.465
50 "	.445
1 hour 35 min	.44
2 " 45 "	.438
4 " 25 "	.43
5 " 15 "	.424
7 " 00 "	.42
9 " 20 "	.425 (?)
11 " 00 "	.36
11 " 25 "	.34
13 " 20 "	.21
14 "	.166
15 "	.145
19 "	.06

The area of foil exposed to the hydrogen at the end of 11 hours was estimated to be about 40 sq. mm, at the end of 13 hours and 20 minutes it was about 10 or 12, and at the end of 19 hours it was about four square millimetres.

The results plainly indicate that the galvanic action depends upon the surface of platinum black exposed to the gas; also that a constant current and electromotive force could be maintained indefinitely by the exposure of a constant area of platinum black to the action of the gases at a constant pressure.

The results indicate further that 20 milligrams of platinum black will maintain a current of $\frac{.50}{360} = .0014$ ampere and $.0014 \times .50 = .0070$ watt, and that the efficiency of such a cell may exceed 33 per cent. A cell containing one pound of platinum black would have a discharge rate of 18.6 watts. By working such a cell at a lower rate a much higher electromotive force and efficiency could be maintained. A cell could probably be constructed that would have an efficiency of 80 or 90 per cent. It would, however, be expensive in first cost.

The difference between the action of platinum black and ordinary platinum foil is worthy of particular notice. When we consider that it requires at least thousands of tons of platinum foil to produce the same effect as a single ounce of platinum black, it does not seem probable that the difference is entirely one of degree. It indicates that there must be a qualitative difference between the actions of the two kinds of platinum.

Polyphase Systems.

To the Editor of The Electrical World:

SIR:—The letters and editorials bearing on this subject in THE ELECTRICAL WORLD for March 23 and 30 have been extremely interesting. They have shown a wide divergence of opinion on the definition for a polyphase system. The books treating of this subject deal principally with the relations of the polyphase components and afford but slight aid by way of definition. So far the literature of the subject has dealt with mathematical relations rather than the physical conceptions underlying these phenomena. This may in part account for the scant attention given to mere definition. It does not seem strictly scientific to employ the condition of constancy of energy in such systems for their definition. The term polyphase applies to a group of phenomena, capable of complex combinations and modifications. The definition then should rest on some property which remains constant through all possible variations. Now the property of constancy of energy belongs only to the case in which the phase difference is symmetrical. Since this is the condition which has thus far been chiefly employed, it is but natural that constancy of energy should be regarded as a fit definition, but should an unsymmetrical phase difference be employed, the definition would have to be modified. A more rational definition for a polyphase system is one based solely on physical properties. Such a system is one in which two or more currents or E. M. Fs, differing in phase by a certain fundamental portion of a period, are co-ordinated into one system, each varying as a sine function of the time. The objection urged against such a definition is that phase difference is often present in single phase working, but these should be regarded somewhat as the harmonics present in a tuning fork. Such auxiliary phase differences should occasion no real difficulty when dealing with fundamental phase differences.

If the definition for polyphase currents given by Mr. Steinmetz be accepted, the error in naming the so-called "monocyclic" system is apparent. From a polyphase standpoint a motor operated on this system runs under some conditions as a single phase synchronous motor, under others as an ordinary polyphase motor. In the case in which the reversing transformer is employed, the energy to the motor is constant because the phases are symmetrically displaced. The transformer acts as a spring, converting the pulsating shocks on the mains into a constant energy supply to the motor. So far as the power feature of such a system is concerned it is undoubtedly polyphase rather than monocyclic. The employment of this reversing transformer seems strange in view of a statement made by Mr. Steinmetz in THE ELECTRICAL WORLD for July 16, 1892. He there states: "Since energy cannot be stored economically by means of electromagnetism, on account of the high iron losses in the hysteresis, the attempts to split up a simple alternating current by means of transformers into currents having a difference of phase have proved to be unsuccessful from an economical standpoint." This statement is not quoted in criticism of the position now taken by Mr. Steinmetz, but rather as a comment on the evident improvement made in transformers during the past three years.

CHICAGO, ILL. W. M. STINE.

A New Method of Deducing the Expression for Electromagnetic Force.

To the Editor of The Electrical World:

SIR:—May I add a word to Prof. Thompson's courteous note in your issue of March 30, commenting on a deduction of the expression for electromagnetic force, which Mr. Carichoff and I recently published?

Prof. Thompson's deduction had not come to our notice when ours was written. An examination of his deduction on page 335, article 343, shows that he begs the entire question by assuming the definition of unit current. Nor does he deduce the expression for the force within a circle and within a solenoid. This last was our chief object.

I wish also to correct two errors in the printing. In the paragraph beginning "Faraday's Law," etc., the phrase of "4π times" should be omitted; and "$K = \frac{1}{2}$," should be $K = 2$.

NEW YORK, N. Y. CARY T. HUTCHINSON.

DIGEST OF CURRENT TECHNICAL ELECTRICAL LITERATURE

BY CARL HERING

COMPILED FROM THE PRINCIPAL FOREIGN AND AMERICAN JOURNALS

Note.—The object of this department is to give a digest of the principal technical articles on electrical subjects appearing in American and foreign periodicals. The abstracts will contain, briefly, the nature of the article, its object, and the most important data or conclusions, as far as the limited space will admit. Abstracts made by the authors, editors, or publishers are solicited and should be sent to the Philadelphia office of THE ELECTRICAL WORLD, 927 Chestnut street. They should be forwarded so as to be received at least as early as the journal in which the original articles appear; they should not be longer than the importance of the subject warrants, and must comply with the general outline given above, the compiler reserving the right to edit or reject them. Such abstracts may be sent in the English, French, or German languages. It will be to the advantage of all concerned if editors of non-electrical journals, or of such electrical journals as are not regularly abstracted, will send the compiler a copy, specially marked, in which any important electrical article appears.

DYNAMOS, MOTORS AND TRANSFORMERS.

Alternators.—The discussion of Mr. v. Dobrowolsky's paper which was abstracted in the Digest March 9 is published in the "Elek. Zeit.," March 21. Mr. Goerges recognizes that a single exciting coil for alternating fields has great advantages, but points out that the lines of force have different lengths and that it will not be possible in such machines to increase the axial length of the poles beyond a certain amount; if alternators are built according to the older design with radial poles it is quite easy to construct the machines longer in an axial direction and the armature winding will then be utilized to much greater advantage as the relation between the useful and the dead portions of the wire will be more favorable; it is therefore very easy to build types for the same speed but for different outputs, without having too many different models. Mr. v. Dobrowolsky replied that the advantages claimed for the old type are easily balanced by the disadvantages of an increased magnetic leakage; if the poles are very long the surface of leakage becomes great and as leakage causes a loss in voltage, especially when the load consists of motors, he believes that that form of cross section of the poles should be chosen which involves the smallest leakage surface, that is, it should be square. He does not agree regarding the utilization of the armature wire as he considers it to be greater with a square or not very long rectangular cross section of the core; the wire is utilized better, the less is required in order to generate the desired voltage and for a square cross section the amount is therefore the least; the total length of wire and not the active or inactive length should be considered; he does not agree with the statement that it is difficult to design such machines for large outputs without involving a high circumferential speed; with the large 400-hp machine at Strassburg the speed is only 20 to 21 metres per second. Dr. Zickermann believes that in such machines the magnets become very large for large ouptuts, so much so that the question of transportation becomes important; he believes what is gained in the magnetic winding is lost again in the armature winding.

Theory and Properties of Synchronous Motors.—Prof. Blondel's serial is concluded in "L'Ind. Elec.," March 25. In this series of articles he pointed out the utility of bipolar characteristics in questions relating to alternators and showed how greatly they simplify the treatment of the subject; calculations are rendered almost unnecessary; it appears that such bipolar characteristics are to alternators as the rectangular ones are to continuous current dynamos; he studied the compensation of the effects of phase shifting on the lines and generators by a method which he believes to be new and which leads to interesting conclusions.

Compensating Coils for Armatures.—Mr. Sayers replies in the Lond. "Elec.," March 29, to the letter of Mr. Menges mentioned in the Digest last week and states that he was aware of the existence of the patent specification referred to and claims that it is essentially different from his.

LIGHTS AND LIGHTING.

Arc Lamps.—A well illustrated description of a number of arc lamps of recent design is published in "L'Eclairage Elec.," March 9.

Arc Light for Municipal Street Purposes.—In an article with this heading by Mr. Wood in the "Elec. Eng.," April 10, he discusses the best locations and method of placing an arc lamp, and concludes that the two having the fewest faults and most advantages are, to fix it at the top of a pole on the sidewalk and to suspend it from a long arm from the top of the pole on the sidewalk over the middle of the street, the second method being considered the better of the two. Regarding the measurement of arc lights he ridicules phonometric measurements intimating that no one knows how much light one candle power is; he approves of measuring the lights by the current and voltage. Regarding the shadows from the lamps he suggests that in order to avoid as much as possible the shadow of the supporting rod in a double arc lamp it should be as far away from the carbons as possible and may be placed in the middle between the two carbons.

Municipal Lighting in Chicago.—"Elec. Ind." for April abstracts some of the data from the paper of Mr. Myers in the March number of "Political Science Quarterly," enumerating items which should be added to the cost per lamp as contained in Mr. Barrett's report, to make it comparable with the cost of the light furnished by private companies.

Classification and Selection of Lighting Systems.—An article under this heading by Prof. Crocker is published in the "Elec. Eng.," April 10. He admits that such a classification must be more or less arbitrary; he discusses the four classsifications: central stations and isolated plants; incandescent and arc lighting; alternating and direct currents; high and low potential; he discusses also the relative advantages of incandescent and arc lighting and those of the direct and alternating currents.

Lighting of the Brooklyn Bridge Cars.—An illustrated description of the system, already referred to in these columns, is published in "Elec. Eng.," April 10.

Electric Lamps in Coal Mines.—The article abstracted in the Digest last week is reprinted in the "Eng. & Min. Jour.," April 6.

POWER AND HEAT.

Transmission of Power System.—A new system adapted to a special case is described by Mr. Hoegerstaedt in the "Elek. Zeit.," March 28. It was designed to meet the requirements of a special case in which the ordinary systems could not have been used; one of the requirements was that a small 6-hp motor was to be run with absolutely constant speed although there was a large motor of 20-hp which was thrown on and off repeatedly as also 14-hp represented in lights; furthermore the efficiency should be very high and the cost of the installation very low. A diagram of the system is given; there is a small constant current generator of about 158 volts and about 10-kw and a large one of 525 volts and 32-kw the current in both cases being 61.3 amperes; these are connected in series, a third or neutral wire like in the three-wire system being connected to that junction; the lights are connected in multiple between the low volt mains and in groups of five in series between the high volt mains, the latter must therefore be cut out in groups of five; the small constant speed motor is connected between the low volt mains and the large motor betwen the high volt mains, the small motor is therefore entirely independent of the large one or of the majority of the lamps; each motor is provided with a resistance which can either be used for starting or, when the motor is cut out, it is capable of carrying the whole current which the motor would have taken; the cost of this installation is given.

Hydraulic Power from High Falls.—"L'Ind. Elec.," March 25, contains an illustrated article by Mr. Thivel in which he discusses the advantages of high falls for the production of electric energy and refers to some European installations.

Electric Welding.—The "Elec. Eng.," April 10, reprints a brief report of a committee of the National Railway Blacksmiths' Association regarding electric welding. The Thompson system is well spoken of particularly for small work; there are about 25 wagon and carriage manufacturers who are using this system and are well pleased with the results; the report admits that a portion of the work can be done better by the older process; many things can be done which it is not possible to do by the older process, as for instance tube welding for ice machines, in which it has been used quite extensively without experiencing any trouble through bad welds; the arc process is merely referred to but not commented upon.

Tesla Two-Phased System.—An illustrated description of some length by Mr. Perry, of the application of this system in the Westinghouse works, is published in "El'ty," April 10.

TRACTION.

Braking of Cars.—In an article by Mr. Baumgardt in the "Elek. Zeit.," March 28, he discusses mathematically the subject of braking cars electrically by using the motor as a generator and endeavors to find whether such system could be modified so as to make it practical to stop a car within its own length. He finds from his mathematical deductions that the distance within which the car will be stopped increases faster than the third power of the velocity; the effect of the electric brake decreases rapidly with the velocity, more rapidly than the square of the velocity, and therefore to obtain a powerful action very strong current must be used; the electric system becomes practical however if the current generated is kept as long as possible at the same value; this he dis-

cusses mathematically and finds that with the same load on the motor which in the first case produced sudden braking in a distance of two car lengths, in the second case produced a quiet braking action in a single car length; he suggests two methods by which the rapid decrease in the brake action can be prevented, the first is to insert a decreasing resistance in the circuit, for instance by having the motion of the lever regulating the resistance dampened by placing it in oil; a second way is to provide contact rings on the motors by means of which an alternating current can be obtained, which is then led through a self induction coil which is specially well adapted for this purpose, as the apparent resistance of it diminishes with a decreasing velocity; this however requires shunt winding of the magnets, which is a great disadvantage.

Electric Railways.—A paper recently read before a society by Mr. Kapp is reprinted in the "Elek. Zeit.," March 28; it is chiefly of local interest and contains data for several European lines. In a comparison between Boston and London he gives the following figures: in Boston there are 430 km of track and in London, although a ten times larger city, there are 400 km on all of which horses are used; the number of car-km per year is 30 millions for Boston and 35 millions for London; the cost of operation for the year 1893 is as follows in marks (about 24 cents): London 17.8, Boston 18.4 millions; the total income, London 21.5, Boston 26.9 millions; costs in comparison of income 82.7 and 68, capital invested 71 and 89 millions, dividends 3.33 per cent. and 9 per cent. At present there are in Germany 340 klm track, 555 motor cars and 420 trailers, representing a total of 9,500 horse power.

Roller Bearings.—Lond. "Engineering," March 29, contains an illustrated description of the Meneely tubular bearing (American) as made by the Siemens Company, including a table of the results of comparative tests made on a street railway with this and with the ordinary bearing which show a considerable saving of energy in favor of the tubular bearing; the power required to drive a loaded car was reduced by 24 per cent. while the speed was increased 20 per cent. and the starting effort was diminished to less than half.

Calculation of Overhead Conductors for Electric Traction.—An abstract of some length of the article by Mr. Dierman from "L'Eclairage Elec." is published in "Jour. Inst. Elec. Eng." for March.

Electric Traction on Steam Roads.—The "St. Ry. Gaz.," April 6, gives briefly some data regarding the Burlington branch of the Pennsylvania Railroad. The track will be relaid with 70-pound T rails; the generator will have an output of 250 kw; combination cars will be used, two will be equipped with a pair of 75 hp motors each, and a third will have four motors of 50 hp each; the motor cars will draw two or three coaches; the line is 67 miles long and will probably be in operation by June 1.

Railway Accidents.—The "St. Ry. Gaz.," April 6, abstracts a part of the report of the Massachusetts Railroad Commissioners regarding street railway accidents; the total number of accidents during the year was 1,341 of which only 29 were fatal, a decrease of 16 fatal accidents as compared with the previous year; on the railroads of the State there were 232 fatal accidents, the number of miles traveled being about three times as great; the total number of accidents was 1,114; it is suggested editorially that the comparison is not fair as the steam roads report only accidents of a serious nature, while trivial accidents are reported in the case of street railways.

Belt vs. Direct Coupling in Small Railway Stations.—The "St. Ry. Jour." for April contains replies from a number of engine builders and engineers to a request to give their views on the relative advantages of direct and belt connection in stations for 10 to 100 cars; no general summary is given.

Legal Aspect of Electrolysis.—An article by Mr. Townsend abstracted in the Digest last week is reprinted in full in the "St. Ry. Gaz.," April 6.

Flexible Conduit System.—The Grant system, in which the contact is made by the car with a conductor in a closed compressible flat tube, is described and illustrated in the "Elec. Eng.," April 10.

Conduit System in Washington.—A brief description of the system to be used by the Metropolitan Company in Washington, which is said to be substantially like the one in Budapest, is given in "Elec. Rev.," April 10.

Welded Joints.—According to the "St. Ry. Gaz.," April 6, cast welded and electrically welded rail joints have stood the severe test of the past winter very satisfactorily, the fractures were few and the contractions were not appreciable.

Newark.—The new power station of the Consolidated Traction Company is described in the "St. Ry. Gaz.," April 6.

INSTALLATIONS, SYSTEMS AND APPLIANCES.

Electric Light for Railroads.—A long Institution paper by Mr. Langdon on "The Employment of the Electric Light for Railway Purposes" is published in full with illustrations and a brief description in the Lond. "Elec. Eng.," March 29. He discusses the use of arc and incandescent lights in railroad stations, offices, yards, etc., the greater part of it referring to the plants of the Midland railway which are described in detail with various data, including costs; the plants include more or less expensive installations in a number of different towns and cities. Regarding incandescent lighting in general he lays stress on the sanitary features, which he claims outweigh the somewhat increased cost, in small installations at least, over that of gas. Regarding the arc lighting he believes that it is destined to be of great advantage in railway workings as it is an invaluable adjunct in the loading and unloading of stock and the marshalling of trains, its greatest utility being in yard shunting. In the description of the installation he gives some data regarding a gas plant for generating the current with Dowson gas. In conclusion he states that the experience so far gained establishes beyond a doubt the great advantages in favor of the electric light in railroad work wherever a large amount of light is required. A copy of the rules and regulations relating to restrictions, duties and management, adopted by this railroad is appended; also the precautionary instructions which have been issued for the avoiding and treatment of accidental shocks. In the discussion Mr. Fletcher gave some data regarding the installation of the Waterloo station, Liverpool. Dr. Preller stated that from his own experience he finds that if city gas can be obtained for 56 cts. per thousand it is preferable to Dowson gas if only for the reason that the first cost of installing a gas plant is saved; regarding the placing of arc lamps experience on the continent had shown that the universal rule was to place lamps 50 to 60 feet high and 80 to 90 feet apart; the rules regarding the treatment of a person who had received a shock are similar to those recommended by D'Arsonval and in this connection he cited one or two cases where these rules had been unsuccessful.

Three-Phase Installation.—A 40-kw installation is briefly described in the "Elek. Zeit.," March 21; it includes 200 incandescent lamps which it is claimed can be connected or cut out of circuit without affecting the voltage or the brightness of the other lamps.

Rules and Regulations.—The "Elek. Zeit.," March 21, contains a discussion by Messrs. Kapp and Siemens of the set of rules for German installations, which are at present under consideration.

Amortization.—The "Elek. Zeit.," March 28, contains a long communication by Mr. Sonnenschmidt forming a continuation of the discussion on this subject.

Hanover.—The data for the operating of the station at Hanover are given at some length in the "Elek. Zeit," March 7.

Electric Plants.—"Elec. Ind." for April contains an article by Mr. Armstrong on "Some Hints on the Building of Electric Plants," another by Mr. Woods on "Some Faults in the Operation of Electric Plants."

Power and Lighting Plant.—An illustrated description of the plant at the Illinois State Penitentiary is given in "Elec. Ind." for April.

WIRES, WIRING AND CONDUITS.

Protection for Overhead Circuits.—In the "Elek. Zeit.," March 21, Mr. Moritz describes and illustrates a comparatively simple method which has been used with great success in Budapest; it refers to the protection of bare overhead wires carrying high tension currents and provides for rendering them harmless if they should break or sag too much, which it accomplishes by short circuiting the line under these circumstances. The system consists essentially of attaching two wires to the conductor which is supported on the left hand side of a pole and leading them to a common insulating support placed on the right hand side of the pole, above the other conductor; the same is done with the other conductor, thus forming a system of wires which cross each other but are not in contact; when one of the conductors breaks or sags too much these wires will come in contact with each other, thus short circuiting the circuit thereby blowing the fuses and rendering the line harmless. If instead of a single circuit there are a number on the same pole it would be a great objection to the system to have all the wires cut out in case of accident to one circuit and to provide against this he uses the following device which has been found to be effective; instead of inserting fuses of like capacity at the two ends or junction of a circuit, he inserts two of different capacities, the smallest of which will blow first and is so constructed that it forms an arc which continues long enough to blow the second fuse of that particular circuit, the terminals of this second fuse being so far apart that an arc cannot be formed; the first fuse is best formed of a lead wire passing through the holes in two-cored carbons whose distance apart is properly adjusted. The cost of this new system is said to be very small and by using it one can reduce the factor of safety against breaking of the wires, the saving in poles alone is then said to be greater than the cost of the protecting device.

Southwark Bridge Explosion.—Major Cardew's report is published with illustrations in the Lond. "Elec. Eng.," Mar. 29, and in abstract with a different illustration in the Lond. "Elec.," March 29. He advances the theory that it was caused by a spark struck by a horse's foot or a wheel, close to the covering; it affords proof of the insufficiency of any ordinary system of ventilation unless it be accompanied by measures tending to render the boxes and conduits gas tight; very thorough ventilation of the culvert did not prevent it from being the locus of a serious explosion when once gas found free access to it.

Air Insulated Cable.—The Clouth system is described briefly in the "Elek. Zeit.," March 21; a very low capacity is obtained without increasing the diameter or the weight; with a copper resistance of 5 ohms per km at 15 degrees C. the mean capacity was only 0.052 microfarad per km and the insulation resistance 10,000 megohms; the insulation consists of cotton enclosing the wire in the form of a gauze having large air spaces; the figures for a number of wires are given and are reprinted in the Lond. "Elec. Eng.," March 29.

Large Telephone Cable.—According to "Der Techniker" for April the largest telephone cable is probably that from 38th street, New York, to Long Island; the outside diameter is 2.5 inches, length 15 miles, weight 21.5 tons; it is said to contain 20 wires, but this is doubtlessa mistake.

ELECTRO-PHYSICS AND MAGNETISM.

Magnetism of Hollow and Solid Cylinders.—"L'Eclairage Elec.," March 9, translates an article by Mr. Ascoli from "Il Nuovo Cimento"

for January on "The Distribution of Induced Magnetism," only the first part of which is given and refers to hollow and solid cylinders. He gives references to a number of recent articles of Grotrian, Schulz and DuBois (all of which have been noticed in the Digest) which he discusses together with experiments of his own. According to Grotrian, Faraday and others, the magnetic moment of a hollow cylinder is not much less than that of the same cylinder having the hollow part filled with iron, from which it seems that the magnetization is superficial, but the present author does not accept this; the superficial distribution is only apparent but not real and is explained by the reaction of the free magnetism induced in the interior field, a reaction which increases with the metallic section and which can reduce the resultant magnetizing force so as to compensate for the increase of this force due to the increase of the metallic mass; he discusses mathematically the possibility of the appearance of an ununiform distribution in spite of the existence of a real uniform distribution with the aid of ellipsoids of revolution and gives a table of values for the magnetic moments. The small difference which is observed experimentally between the moments of different cylinders of sufficiently great section can therefore very well be due, like in ellipsoids, to a reaction of the induced magnetism on the interior field, a statement which he will demonstrate in the second part of his article; in the present portion he shows that the variation of the magnetizing force in solid cylinders of different relations of diameter and length is quite analogous to that in ellipsoids; he gives a table of the magnetizing forces at the centre of cylinders of various lengths. In passing to hollow cylinders he states that experiments have shown that hollow cylinders act like solid ones of the same metallic cross section; the small observed differences could be due to the reaction of induced magnetism on the magnetizing fields. He describes experiments made with cylinders composed of the same number of iron wires which may be made into hollow cylinders by placing them around cylinders of wood, the cross section always remaining the same; with this he made ballastic galvanometer measurements. Let r be the ratio of the length to the diameter, T the galvanometer deflection for the hollow and C that for the solid cylinder, then the ratio of T and C tends to be unity when r increases and as rapidly as the magnetizing force increases. Other measurements were made with cylinders of the same diameter and length but made up of a different number of iron wires, some hollow and some solid, and he finds that the ratio of T to C tends toward unity for the same current and more rapidly as the thickness of the cylinder increases. Other tests were made with cylinders whose lengths were 25 times the diameter, the results showing that a hollow and a solid cylinder of the same (metallic) section act the same for sufficiently large magnetizing currents. Regarding dynamos he states that the effects obtained in these experiments by increasing the length can be produced by any other means which will diminish the reaction, one of which is to make nearly a closed magnetic circuit, like in dynamos, it is therefore easy to predict the results obtained by Schultz concerning the approximate proportionality between the flux and the section of the metal and it is not necessary in order to explain results to assume any special method of magnetization.

Model of Molecular Magnetism.—The Lond. "Elec.," March 29, published an illustrated description of a new model exhibited by Prof. Ewing at a recent meeting, to illustrate the molecular action which occurs in iron when caused to revolve in weak or strong magnetic fields; the action is of special interest since Mr. Bailey showed that in a sufficiently strong field the hysteresis of revolving iron disappears. In the model a number of pivoted magnetic needles are placed on a glass plate between two coils, the glass plate itself being pivoted so that it may be revolved, the action therefore resembles that which occurs in a dynamo armature. If the plate carrying the needles is made to revolve slowly in a field of moderate strength the lines in which the magnets tend to arrange themselves become strained and break up, new lines being formed which in their turn break up as the plate goes on revolving; this breaking and rearrangement of the grouping involves dissipation of energy, shown by the violent swinging of the needles, a process which is associated with hysteresis and corresponds to the case of an ordinary dynamo armature; but when the field is quite strong so that the needles are parallel there is no longer any violent breaking of molecular ties as the plate revolves and consequently there is no dissipation of energy. When the field is weak, in which case there is hysteresis, the model shows that the expenditure of work is not continuous but is in a series of spasms, it sometimes even happens that the new lines assumed by the magnets immediately after breaking away from the earlier grouping are so inclined that the turning moment becomes negative. With a strong field the model shows a remarkably complete disappearance of hysteresis, the glass plate carrying the needles could be spun around quite rapidly without causing the magnets to oscillate.

Electromotive Force of Magnetization.—A translation in abstract of Mr. Hurmuzescu's paper is published in the "Jour. Inst. Elec. Eng." for March.

Temperature of Transformation of Iron and Steel.—The "Jour. Inst. Elec. Eng." for March abstracts a paper by Mr. Charpy from the "Comptes Rendus," Vol. 119, No. 18. He applied Osmond's method for studying the dissipation of heat at different temperatures for several samples of steel; the apparatus consists of a recording pyrometer and a furnace heated by an electric current passing through platinoid wire; a table of the critical temperatures is given as also some brief references to the magnetic properties.

Experiments with Alternating Currents.—Referring to the recent article by Mr. Griffiths, abstracted in the Digest March 23, Mr. Sadowsky in a communication to the "Phil. Mag." for April communicates an abstract of a paper published by himself, in which he gives the results of some experiments similar to those of Mr. Griffiths, with the Lenard bismuth spiral. The following results agree very well with those of Mr. Griffiths: in a strong field absolute silence in the telephone is never obtained but only a minimum of sound; the superficial distribution of alternating currents is without influence on the resistance; the resistance of bismuth depends upon the phase of the current. The following do not agree entirely with those of Griffiths: bismuth spirals have something like the self-induction but not equivalent to it; he finds the difference of resistance with a frequency of 500 without field to be as stated by Lenard and Zahn. He also found that Lenard's statement that the difference of resistance is due to the currents of great frequency is erroneous; this he discusses mathematically.

Theory of Alternating Currents.—An anonymous article is begun in the Lond. "Elec. Eng.," March 29, intended for electrical engineers who have not had an opportunity to attend a course of instruction at a technical college; it proposes to give the principles underlying the subject, to explain the physical facts, etc., using as little mathematics as possible; the present portion is on induced currents and self-induction.

Passage of an Oscillator Wave Train Through a Plate of Conducting Dielectric.—The Physical Society paper by Mr. Yule mentioned in the Digest Feb. 9 is published in full in the "Phil. Mag." for April; it is mathematical in character and quite long.

Double Refraction of Electric Rays.—Mr. Mack's paper mentioned in Digest last week is abstracted more fully in the "Elek. Zeit.," March 21, and still more so in "L'Eclairage Elec.," March 9.

Propagation of Variable Currents in Conductors.—"L'Eclairage Elec.," March 9, contains a mathematical article of Mr. Lamotte on this subject.

Energy Movements in the Medium Separating Electrified or Gravitating Particles.—The "Phil. Mag." for April published in full the Physical Society paper by Mr. Allen; (a reference to an abstract of this paper was given in the Digest April 6 where it was incorrectly credited to Prof. Minchin).

Glow Discharge.—The results of a research by Mr. A. Herz described in "Wied. Ann.," Vol. 2, 1895, are given in the "Phil. Mag." for April.

Electric Causes of Earthquakes.—"L'Elec.," March 30, contains an article by Mr. Dary in which he shows that the idea that earthquakes are of electric origin is not a new one; he gives the results of a number of observations and among them cites some cases showing the effect of the geological composition; these he believes can be explained only by the action of electric discharges the effect of which is more violent at points which offer greater resistance to the passage of the current.

Electric Currents of High Pressure and Periodicity.—Mr. Swinton's paper abstracted in the Digest last week is reprinted in full with the illustrations in "El'ty.," April 10.

Conductors and Insulating Compounds.—An alphabetical list of materials compiled from patents is published in "Elec. Rev.," April 10.

Liquefaction of Gases.—A long article by Mr Olszewski with illustrations of the apparatus is published in "Eng. & Min. Jour.," April 6.

ELECTRO-CHEMISTRY AND BATTERIES.

Plant for the Extraction of Gold by the Cyanide Process.—A paper by Messrs. Butters and Smart with this title was recently read at the "Inst. of Civ. Eng.;" it does not appear to have been published in any electrical journals. Regarding the electrical process of Siemens & Halske they state that 110 hours are required on account of the weak solution with which it could be worked, while the zinc process occupied from 60 to 84 hours. A detailed account is given of the Worcester cyanide works where this electric process is used.

Electricity in the Chemical Industry—A recent lecture by Prof. Haeusserman is reprinted in the "Elec. Zeit.," March 7; he gives a general summary of the subject without apparently including anything new.

Remarkable Electrolytic Phenomenon.—A paper with this title by Mr. Reed is published in the "Jour. Frank. Inst." for April. Metals used as negative electrodes are never dissolved or are seldom affected chemically by the action of the current; in the present paper he shows what appears to be an exception to this rule. With certain solutions, as borax for instance, with a negative electrode of lead, a high E. M. F. (about 100 volts) and a high current density, a precipitate appearing like a cloud of black smoke is formed around the electrode; the negative electrode is eaten away rapidly showing that the precipitate was formed at the expense of the lead; the precipitate was found to be an impalpable powder resembling lead; the electrode is reduced to a point with a smooth polished surface. A list of a number of electrolytes is given with which this can be produced and another with which it is not produced; with ammonium oxalate and a positive electrode of platinum, what appeared to be a lead peroxide was deposited on the platinum although no lead was originally in the solution. A number of other metals were tried but among them only arsenic acted in a similar manner; in that case a film of brown solid arsenic hydride was formed which floated on the liquid. The formation of the lead precipitate was found to be most rapid with a solution of borax; sodium thiosulphate

gave a deposit of sulphur at the positive pole; strontium nitrate instead of giving the lead powder gave a blue flame around the point of the cathode. These results seem to indicate the possibility of obtaining, by the use of high electromotive force and high current density in electrolysis, products of an entirely different nature from those of ordinary electrolysis.

Electrolysis of Copper Sulphate.—The results of the investigation of Mr. Chassy mentioned in the Digest April 6, referring to the electrolysis of a hot solution, are given in the "Eng. & Min. Jour.," April 6.

Electrochemical Progress During 1894.—Mr. Swinburn's short article abstracted in the Digest Feb. 2, is reprinted in the "Elec. Age," April 6.

UNITS, MEASUREMENTS AND INSTRUMENTS.

Researches with the Induction in Cables.—Dr. Breisig's long article is continued in the "Elek. Zeit.," March 21 and 28; it contains a large amount of data and a number of curves and illustrations of the apparatus used. Some of his conclusions are as follows: the co-efficient of mutual induction of two conductors diminishes very rapidly with an increased number of impulses when the conductors are surrounded by a metallic casing like the lead covered cables with which the experiments are made. One of the curves shows that the quantity of electricity induced per second at first increases with the number of impulses, that at 22 impulses per second it reaches a maximum after which it diminishes; the curves for two other double circuits coincide up to 15 impulses with the tangent at the beginning and nearly so up to 26 impulses, at which the protecting action of the metallic shield begins to show itself but only in a small degree. The results of the measurements with alternating currents are quite complicated and extended experiments in that direction were therefore not carried out. He considers that these researches prove that a metallic shield for a conductor does not necessarily mean that it is protected from induction from the outside, it depends very greatly on the number of changes in the current, if this number is small a shield of appreciable cross section has no decided protecting action; referring in particular to the tin foil covering, the results show that with a moderate number of current changes the conductor acts practically as if it was not shielded, but the shielding action becomes very great when the current variation is very rapid, as for instance in telephone transmission. The continuation in the issue of March 28 describes experiments with long underground circuits and includes a number of curves.

Artificial Telephone Line.—The "Elek. Zeit.," March 7, reprints a paper by Dr. Breisig in which he describes with the aid of several illustrations an artificial line for testing purposes, which has recently been constructed for the German government telephone department; the line contains resistance, capacities introduced at successive points, and self-induction; it was concluded to be unnecessary to have artificial leakage as that was of little importance in telephone testing; the self-induction however is very important as the apparent resistance depends chiefly on it. The construction is described and illustrated, the greatest difficulty being encountered in giving it self-induction; a number of coils are wound on a U-shaped core of iron having an armature whose distance from the core can be varied.

Determination of the Ohm.—A paper by Mr. Himstedt from the "Wied. Ann.," vol. 54, p. 303, is abstracted briefly in the "Elek. Zeit.," March 21. He describes a method which is said to be very convenient and can be recommended because it requires the measurement of only two angles, a determination of the number of current interruptions per second and the co-efficient of mutual induction of the two coils. The mean value found was 1.06282.

Electrochemical Actinometer.—An abstract of some length of the recent paper (in French) by Mr. Marechal is published in "Jour. Inst. Elec. Eng." for March.

A Simple Form of Harmonic Analyzer.—The Physical Society paper by Mr. Yule mentioned in the Digest last week is published in full in the "Phil. Mag." for April.

The Clark Cell when Producing a Current.—In the "Phil. Mag." for April Mr. Skinner replies to the recent criticism of Prof. Threlfall mentioned in the Digest March 23.

Useful Approximate Units.—The following are given in the Lond. "Elec.," March 29. The ohm is very close to the resistance of a pure copper wire 10 mils in diameter and 10 in. long at about 60 degrees F. A volt is approximately $\frac{7}{10}$ of the E. M. F. of a standard Clark cell; 687 standard cells give very nearly 1,000 volts.

TELEGRAPHY, TELEPHONY AND SIGNALS.

Telephone Rates.—The leading editorial in the "Elek. Zeit.," March 21, discusses the proposed reduction of the telephone rates in Germany. It appears from the data that the cost per communication in Berlin is slightly less than one cent, which is lower than anywhere else; the conclusions are that the rates should be reduced according to the size of the system and the extent of its use.

Origin and Development of the Telephone Switchboard.—The paper by Mr. Kingsbury mentioned in the Digest Feb. 16, 23, March 2, is published in full with the illustrations and discussion in the "Jour. Inst. Elec. Eng." for March.

Interior Block System of Telephone Wiring.—A brief description with some illustrations is given in the "Elec. Rev.," April 10.

Historical.—"El'ty," April 10, reprints an article by Mr. Syme on Sir Francis Ronalds from Lond. "Lightning," Sept. 1 and 8, 1892.

MISCELLANEOUS.

Electric Compass.—"L'Elec.," March 30, contains an illustrated description of the Beisier system in which a vessel is steered automatically by the compass by means of an electric device; the system has already been described in the Digest.

Educational.—The discussion which has been going on for some time in the Lond. "Elec." is continued in the form of a long editorial in the issue of March 29; the purport of it is that a decided distinction should be made between scientific education and technical instruction.

Crompton's Address.—The address of Mr. Crompton, which was abstracted in the Digest Feb. 16, is published in full in the "Jour. Inst. Elec. Eng." for March.

Abstracts.—The "Jour Inst. Elec. Eng." for March contains abstracts of a number of recent electrical papers all of which have been noticed in these columns.

Fiske's Range Finder.—A well illustrated description with diagrams of connections of the latest improved form is published in the "Elec. Eng.," April 10; the instrument has been in use for more than five years in various forms and has finally been adopted by the U. S. Navy in the present form. Among the improvements are that the bridge wire is not in the form of an arc but is wound on a cylinder of insulating material and may thereby be completely protected from the effects of water; there is also an automatic adjustment of the contacts and a temperature corrector.

New Books.

THE SCIENCE AND MODE OF SOLAR ENERGY THROUGHOUT THE UNIVERSE. By I. W. Heysinger, M. A., M. D. Philadelphia: J. B. Lippincott Company. 363 pages, 61 illustrations.

The aim of this work is to present to the world a new hypothesis which shall account for the accumulation and continuance of supply of the vast amount of energy stored in and unceasingly poured forth from the sun and other so-called fixed stars of the universe.

After briefly analyzing the seven different hypotheses now in vogue, pointing out their fallacies, and reviewing the principal astronomical and physical phenomena bearing on the subject, the author proceeds to formulate his theory essentially as follows:

Highly attenuated vapors, principally aqueous, and capable of conducting electricity with very slight resistance, are assumed to be diffused throughout interstellar space. In the molecular tensions of these vapors are locked up vast stores of potential energy. The planetary bodies, having opposite electrical polarity from that of the relatively fixed sun, by their orbital and axial motions in connection with the induction of their highly electrified atmospheres, act, in some way not very clearly explained but likened to the action of an influence machine, to unlock or release the potential energy contained in the regions through which they pass, causing it to appear as electrical energy in the form of currents of enormous quantity and electromotive force flowing in a constant stream to the sun, there to disappear as electricity and reappear as solar light and heat. These electric currents decompose some of the aqueous vapor concentrated by gravity about the solar bodies, depositing hydrogen at the sun and oxygen at the planets; while, at the same time, by forcing their way through the hydrogen envelope of the sun, they produce its intensely heated and highly incandescent condition. The sun's radiant energy, in its transmission through vast distances, is gradually retarded and finally disappears in the restoration or increase of the molecular tensions of the vapors of space, where it remains as potential energy ready to be again called into activity, perhaps ages hence, through the action of some distant world.

The phenomena of comets, of temporary, variable and multiple stars, and of the nebulæ are discussed, the author's hypothesis being applied to their treatment and also to that of the genesis of solar systems.

By the same process of reasoning based upon pure assumptions, we presume the author would not have the slightest difficulty in plausibly demonstrating that the moon is really made of green cheese.

ELECTRIC LIGHT INSTALLATIONS. A Practical Handbook. By Sir David Salomon. Vol. III.—Application. Seventh edition, revised and enlarged. New York: D. Van Nostrand. 235 pages, 33 illustrations. Price, $1.50.

This is the last volume of a series of three handbooks on isolated electric light installations. The first volume deals exclusively with storage batteries and their management; the second volume is mainly descriptive of apparatus and the present one takes up the subject of installation of circuits and operation. In the first chapter the precautions necessary to be observed in installation are given, including the regulations of the English Institution of Electrical Engineers for the "prevention of fire risks." Chapter II. deals with conductors, including insulation jointing, calculation, installation, etc. We note a confusion in regard to the cause of the increase of drop with alternating current; the author quotes Prof. Hughes as having first called attention to this effect, whereas his classical paper referred to the ohmic increase of resistance due to alter-

nating currents, and not to inductive drop—the former being negligible with practical frequencies and usual diameters of conductors. The data in the table given in this chapter of the relative amount of heat produced by various sources of illumination do not agree with those on the same subject from the authoritative experiments of Heim (contained in Palaz "Industrial Photometry") but the differences are not of practical importance.

Chapter IV. is on "Methods of Working," and contains much practical information on a wide range of topics, including the operation of storage battery plant motors. The arrangement of station devices is also treated, and some points of theory considered in a simple manner. Alternating currents and "estimates" are touched on in the two succeeding chapters, and the book concludes with a brief account of the Broomhill installation and of the wiring at the Grosvenor street (London) station, with results. The Broomhill plant contains many features of interest, and its extent may be judged from the fact that there are 60 or more motors in use for various purposes.

As in the case of the preceding volumes, the chief value of the present one lies in the many practical hints and discussions scattered throughout the pages, and as these are the result of the author's extended experience with his own plant, they have a direct bearing on every-day work. While the view of the art of electric lighting given in these three volumes is rather a restricted one, the work yet forms the most satisfactory one from a practical standpoint that has yet appeared.

THE WORK OF HERTZ AND SOME OF HIS SUCCESSORS. Being the substance of a lecture delivered at the Royal Institution, June 1, 1894, by Prof. Oliver J. Lodge, F. R. S. With additions and appendices. London: "The Electrician" Printing and Publishing Company, Limited. 58 pages, 32 illustrations and portrait. Price, $1.

After Hertz, Prof. Lodge has been most closely identified in the minds of the electrical public with the experimental development of the electric wave theory, and, therefore, coming from the pen of his English follower and co-worker, this exposition of the great work of the lamented young German scientist is peculiarly appropriate. The volume is based upon a lecture delivered by Dr. Lodge before the Royal Institution, but which, as printed, is considerably extended by foot notes and several appendices. We will add that the lecture first appeared in print in the columns of the London *Electrician*.

The greater part of the text consists of an account of the experiments made during the lecture to illustrate the character of Hertzian phenomena, and the illustrations in the printed volume with the accompanying explanations give the reader an excellent idea of the experiments performed. Intended for a non-scientific audience, the language and development of ideas are extremely simple to follow, and we strongly advise those who wish to keep pace with electrical science to read this book, for it is not too much to say that in a very few years the ideas here developed will completely supersede the conceptions upon which the present science of electricity is based.

The opening pages are devoted to a feeling tribute to the memory of Hertz, and to a resume of the knowledge on the subject of electric waves before the era of Hertz. A number of simple experiments are then described illustrating electric wave phenomena, after which Dr. Lodge introduces the apparatus and experiments originated by himself—among others his "coherer," which is claimed to be by far the most sensitive detector of Hertzian waves yet devised. The several appendices contain an account of the work of others in the Hertzian field who were not mentioned in the lecture, and of more extended notices of some points referred to in the body of the text.

STANDARD METHODS IN PHYSICS AND ELECTRICITY CRITICISED, and a Test for Electric Meters Proposed. By H. A. Naber. London: George Tucker. 114 pages, 2 illustrations. Price $2.

The book is chiefly written for men of science and laboratory experimenters, and is an erudite and judicious criticism of methods of measuring in physics and in electricity, and a careful review of the instruments used.

In electrical measures the author is a strenuous upholder of the gas voltameter, of which he has devised a special form fully described in these pages, and this latter should be of great value for testing electric meters, and for other purposes where it is necessary to take accurate note of the quantity of electricity passed through the meter.

PRACTICAL TELEGRAPHY. By F. E. Wessels. Philadelphia: Bloomingdale & Company. 24 pages. Price, 50 cents.

This little pamphlet has for its object the instruction of those wishing to become practical telegraph operators.

Beginning with a brief outline of the work of Prof. Morse, the book next considers the fundamental principles of the telegraph and the construction and maintenance of batteries. Very full instructions are given for the guidance of the learner, with forms of commercial and railroad despatches and tables of abbreviations.

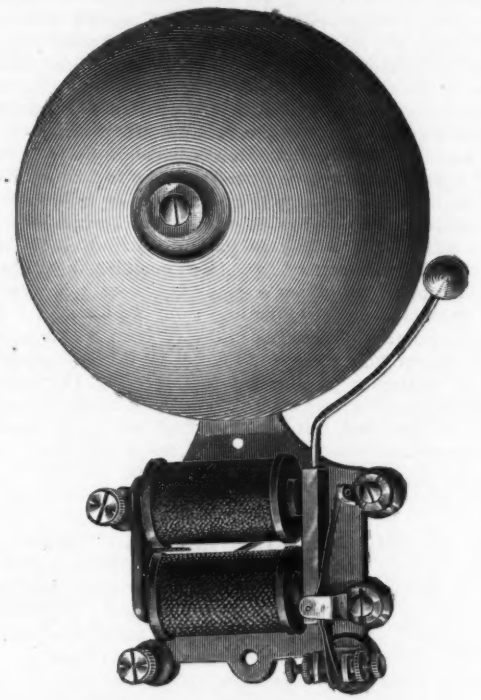
ANNUAIRE DU BUREAU DES LONGITUDES FOR THE YEAR 1895. Paris: Gauthier-Villars et fils. Price 1 franc, 50.

This little volume contains an immense amount of information useful to travelers and to scientists generally. The book is intermediate in character, between the Nautical Almanac of Great Britain and the World Almanac of New York. The tables throughout the book have evidently been carefully, and in many cases specially, prepared by eminent writers. The chapters devoted to "Lunar Atmospheric Waves," the "Geodetic Congress at Innspruck," "The Observatory of Mt. Blanc," "Photographic Photometry," the report upon the proposal to unite the civil and astronomical day, and the magnet charts of France, are of special interest, and convey the most recent information on these subjects, which it would be difficult to obtain elsewhere.

An Improved Skeleton Bell.

It would appear that the improvement of electric bells had reached its limit, but the new bell made by H. E. & C. Baxter, of Brooklyn, and which we illustrate herewith, effectually confutes such an assumption.

The parts are highly finished nickel, on a well japanned frame. The adjusting, contact, pivot and binding posts have a patent fastening which



IMPROVED ELECTRIC BELL.

centralizes and securely holds them. The bell has both battery and stroke adjustment, provided with set nuts. By placing the double adjustment at the back of the armature, the adjustable contact screw is abolished, which is a decided improvement, as the make and break of the contact points are the same with either a long or short stroke, allowing the magnet to be fully energized throughout the whole forward movement of the armature. The principal styles of these bells are the "Standard," "No. 7,707," and "Style D."

Asbestos Insulated Magnet Wire.

Patents have recently been issued to Mr. L. W. Downes, of Providence, R. I., for a new method of insulating wire with asbestos, the object of the invention being the production of a wire, suitable for winding all types of electrical machinery, the insulation of which will not be so readily destroyed by heat as that at present in use. Previous attempts have been made to insulate wire with asbestos, but the difficulty has been to reduce the coating to anything like reasonable dimensions. By the new process, however, this is largely overcome and a coating is produced which compares very favorably with double wound cotton, the thickness of the insulation on wires from No. 18 to No. 12, B. & S. gauge, being .016 inch, and that on Nos. 2 to 11 being .018 inch.

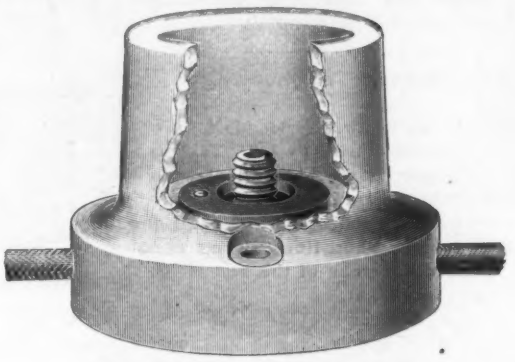
A sample card or exhibit was recently sent out illustrating the heat resisting properties of the new wire. Upon it is shown a sample of the finished wire having a smooth, even coating of very dense and compact fibre, so tough that it is difficult to make any impression upon it. Sample No. 2 is a piece that has been connected to a sample of ordinary double wound cotton, and subjected, with it, to the heating effect of a heavy current. The cotton coating is almost completely burned off, leaving but a small, charred fragment at the extreme end, while upon the asbestos absolutely no impression seems to have been made. Another sample is shown which is said to have been subjected to a temperature sufficiently high to raise the wire to a red heat; the covering is left apparently as smooth and flexible as before. Sample No. 4 represents yet another and more severe test, as in this the copper is claimed to have actually been melted for a short distance inside the insulation, leaving this, however, fairly intact except at the point of fusion. The

insulating properties of the wire are said to be extremely high, and tests made upon samples after they have been raised to a red heat are reported as having shown an insulation resistance of over 95 megohms per foot. The claim is made that by using this wire for winding coils it will be possible to do away almost entirely with such material as oil paper, linen, etc., thus saving space, and at the same time producing a coil that is practically indestructible.

A Weatherproof Socket for Illuminated Sign Work.

We illustrate herewith a weatherproof lamp socket which has been put on the market by the Bryant Electric Company, of Bridgeport, Conn., to meet the increasing demand for a socket to be used for illuminated signs and kindred work.

Much annoyance has been experienced heretofore from the failure of lamp receptacles to withstand the action of the weather, and the manufacturers of the socket here shown have taken particular pains to make it reliable in this respect.

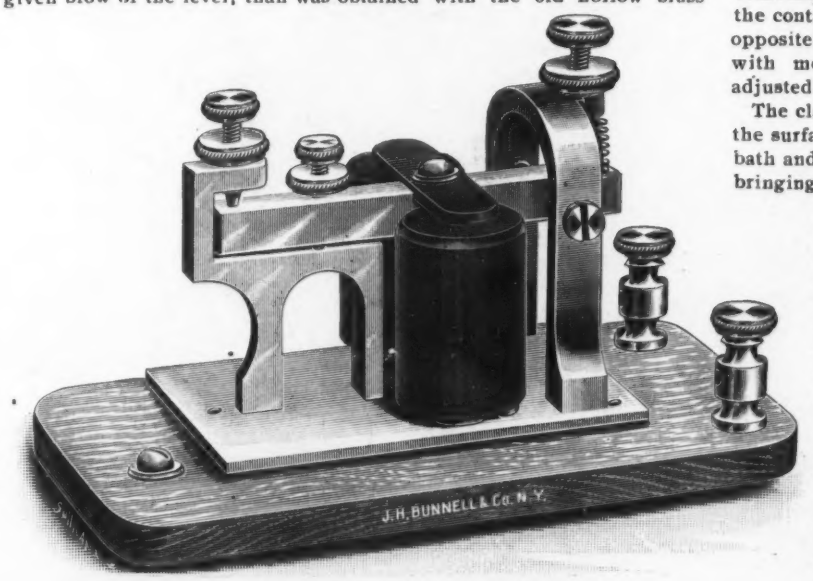


NEW WEATHERPROOF SOCKET.

It will be noticed that the terminals are brought out at the side instead of at the back, so as to avoid any trouble from the moisture which penetrates between the back of the socket and the face of the board upon which it is fastened.

A New Telegraph Sounder.

The accompanying engraving illustrates a new telegraph sounder, which has just been brought out by J. H. Bunnell & Co., of 76 Cortlandt street, New York. The features of the sounder are an improved winding, an elevated baseplate and an aluminium lever. As will be noticed upon a close inspection of the illustration, the metal base of the sounder is raised above the wood base, and rests upon three short metal posts; the result of this construction is a much greater volume of sound, for a given blow of the lever, than was obtained with the old hollow brass baseplate, which was the feature of the Giant sounder and was for many years considered the best construction known.



NEW TELEGRAPH SOUNDER.

The combination of this baseplate with the aluminium lever and improved winding enables the sounder to give standard service with only one cell of gravity battery. The saving thus obtained in battery maintenance will naturally be quite a considerable item where a large number of sounders are in use.

Another improvement embodied in the new sounder consists of making the trunnion screws non-adjustable.

Electrolytic Heating.

A number of patents relating to various devices to be used in connection with the heating of materials in an electrolytic bath were issued on April 9 to Mr. George D. Burton, of Boston, Mass.

Patent No. 537,004 is on an invention relating to the art of heating metals for forging or other metal working purposes by immersing the portion to be heated in a bath and then passing an electric current through it of such a character as to form an incandescent gas envelope or electric arc at and below the surface of the solution and around the metal to be heated, whereby the heating of the metal is quickly effected. The claim for this invention is on the art of heating metal, which consists in submerging or partially submerging a metal in a bath consisting of an aqueous solution of carbonate of soda and borax, passing a current through it and then subjecting the heated and softened metal to a metal working operation.

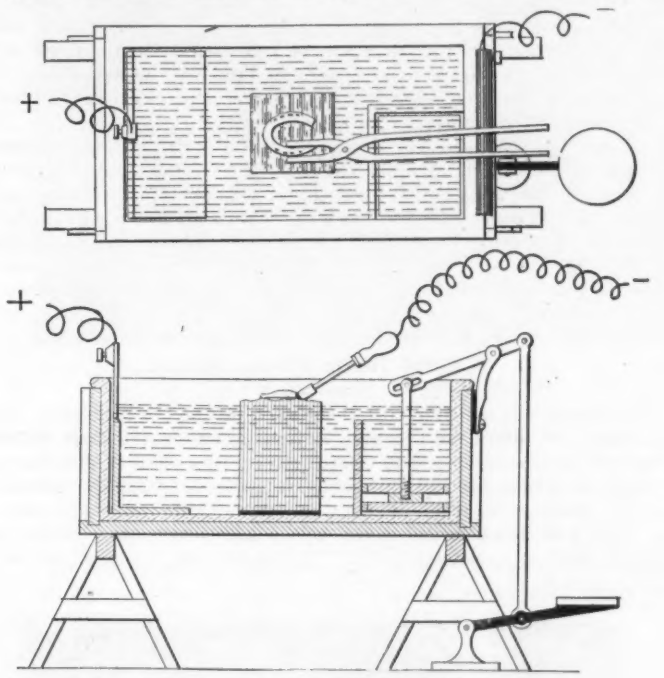


FIG. 1.—ELECTRIC HEATING BATH.

In another patent, No. 537,006, the invention relates to a clamping device whereby the metal is held while being heated, and includes the combination of a bath, an automatic clamp mounted on the edges of the containing tank and means for connecting the bath and clamp with opposite electric poles. The movable jaw of the clamp is provided with means for regulating its action, and to permit the bar to be adjusted in any desired incline.

The claims for patent No. 537,007 are on supporting the metal upon the surface of a non-conductive bed above the surface of an electrolytic bath and then by lowering the bed or raising the height of the liquid bringing the bath and the metal into electrical connection.

Fig. 1 illustrates the apparatus to which the specifications refer, another form being illustrated in the patent record on another page. The tank is preferably made of porcelain or fire clay, or earthenware lined with porcelain, and to protect it against breakage it is surrounded with a wooden jacket. The electrolyte consists of a solution of sal soda of a specific gravity of 1.305 at 84 degrees F. or of a solution of equal parts of sal soda and cream of tartar at a specific gravity of 1.255 at 77 degrees F. or of a solution composed of water, carbonate of soda and borax, in the proportion of three quarts of water to 12 pounds carbonate of soda and one pound of borax. The anode plate has a contact surface with the liquid much greater than the area of contact of the article to be heated. This plate is composed of lead, copper, carbon or other suitable conducting material, and is preferably of an angular form, one part resting on the bottom of the tank and the other being parallel with the end.

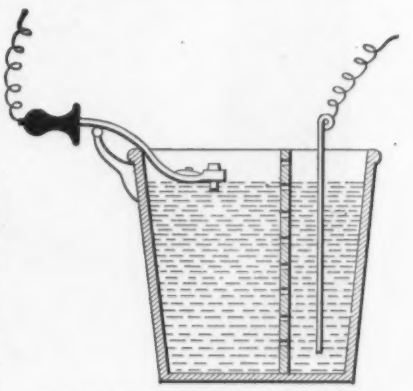


FIG. 2.—BOILER RIVET HEATER.

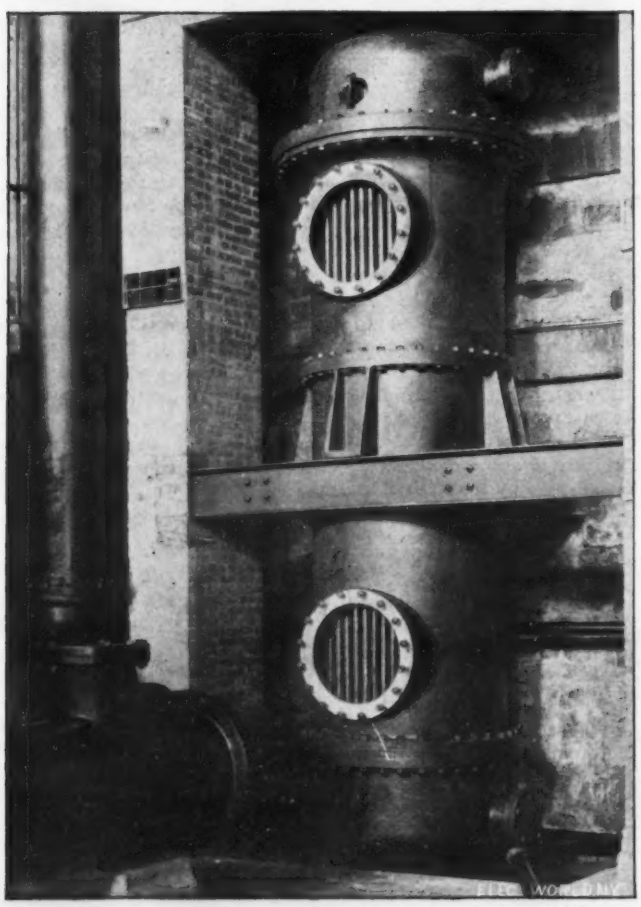
A work bed for the metal to be heated is disposed in the tank, the surface being normally above the surface of the bath; it is composed of non-inductive material, such as fire clay, stone or slate, preferably the latter, and its upper surface is corrugated or serrated, or otherwise roughened. This non-conductive surface has a rest for the metal which is to be heated, and its corrugated or roughened surface permits the liquid to intervene between the metal and the bed, whereby an arc or arcs are formed on the under side of the metal. The current used has a voltage of from 120 to 500 volts and is from six amperes upward, according to the size or quantity of the metal to be heated.

Another patent, No. 537,008, relates to an apparatus in which the working circuits are so arranged in connection with the main circuit and a resistance, that the latter will be automatically cut out while the work is being heated, and thrown in when the work is withdrawn, such resistance serving as a cushion to absorb the sudden shock incident to the removal of the work.

In patent No. 537,402 the claims are for a portable tank for heating metals, provided with a porous partition and a bracket at one side serving as a rest for the work holder; the latter is connected with an electric conductor and provided with an insulated handle and with holes for holding the metal to be heated, the holes being surrounded by raised rims. Fig. 2 is a vertical transverse section of a tank for holding the electric bath, and shows a holder supporting a rivet to be heated.

A 4,000 Horse Power Heater.

The accompanying illustration shows a mammoth feed-water heater recently installed in the Brooklyn Edison station by the Goubert Manufacturing Company, 14 and 16 Church street, New York. This heater is one of the largest ever built, having a capacity of 4,000 hp. As shown by the illustration, it is of the Goubert vertical type, built entirely of iron and brass with curved upper and lower tube plates and patent flexible expansion joint. This is the only joint in the heater



A Mammoth Heater.

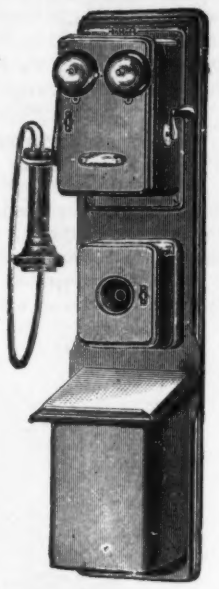
that is not rigid, all the differential expansion between the shell and the brass tubes being taken care of at this point.

This heater, like all the Goubert standard heaters, is built for a working pressure of 160 pounds per square inch, and is of the regular water tube type, the claims for which are that the pressure being inside, the tubes cannot collapse; they cannot leak at the ends because the greater the pressure the tighter are the tubes; the area for the passage of steam between the tubes is from eight to sixteen times as large as that of the exhaust pipe, and consequently back pressure is eliminated.

By removing one head all the tubes are easily accessible for examination and cleaning. There are ample provisions for the removal of scum and sediment. The outer shell of the heater is bolted to the lower water chamber, but is free to expand independently of the tubes, its only connection with the upper tube plate being made by means of a flexible copper gasket which serves to close up the space between the upper tube plate and shell, no parts under boiler pressure being weakened to provide for differential expansion. The expansion joint is entirely outside and only in contact with exhaust steam, can be replaced like an ordinary gasket, and is said to suffer very little deterioration from the fact that it never has to spring more than $\frac{3}{64}$ of an inch either way. Suitable surface and mud blow-outs and a hand-hole are provided for cleaning.

The Phœnix Telephone.

We illustrate herewith the standard telephone outfit manufactured by the Phœnix Interior Telephone Company, 131 Liberty street, New York. These instruments are furnished in any wood desired, and are guaranteed efficient over long or short lines. The transmitter is claimed to be one of the best of the Blake type on the market.

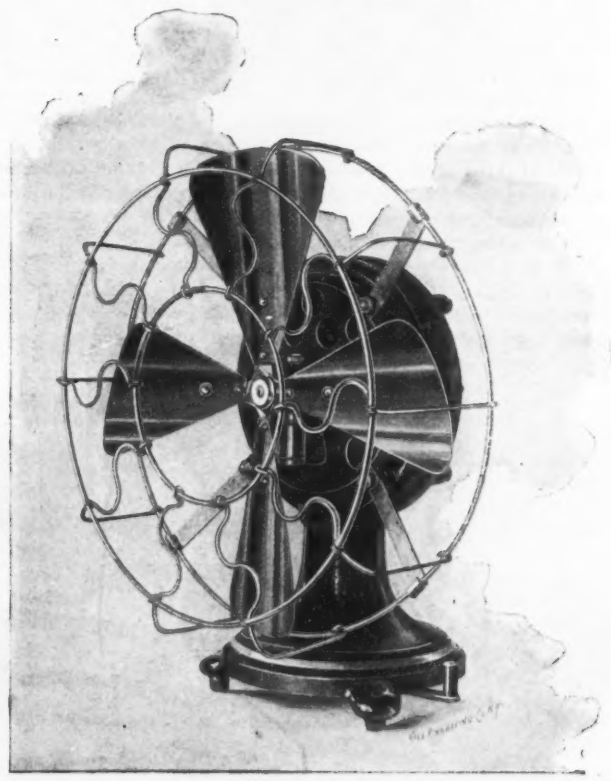


Phœnix Telephone.

The Phœnix Company also manufactures desk sets, watchcase receivers, and other special forms and outfits, among them being an independent switch system for interior service.

New Lundell Fan Motor.

We illustrate below the new alternating current Lundell fan motor manufactured by the Interior Conduit and Insulation Company, 527 West 34th Street, New York, which embodies several improvements over last year's type. These machines are designed in two types, high frequency for from 14,000 to 16,000 alternations per minute and low frequency for



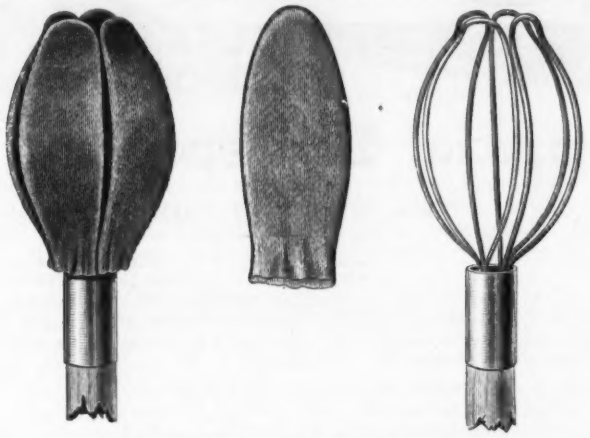
Improved Lundell Fan Motor.

7,200 alternations per minute, and are made to run on either 52 or 104 volt circuits.

The motors are handsomely finished in black Japan with gilt ornamentation, and all the outside fittings, fans, guards, etc., are either polished brass or nickel plated. The bearings are self-oiling and self-aligning. A switch is provided which enables the fan motor to be run at any of three speeds. Tests of the high frequency motor are said to show a consumption of 1 3-10 amperes at 52 volts, running a 12-inch fan at normal speed.

Incandescent Lamp Cleaner.

The illustration below shows a very simple and ingenious appliance for cleaning incandescent lamps, which has just been put on the market by A. A. McCreary, 136 Liberty street, New York. The cut is almost self explanatory and shows the device to consist of four curved wire fingers attached to the end of a stick; on each of these fingers is placed a flannel mitten. In operation it is only necessary to slip the



INCANDESCENT LAMP CLEANER.

cleaner over the bulb of the lamp and give it two or three turns in order to effectually clean off all the dust. For removing lamps from their sockets small rubber grippers are provided which are slipped over the outside of the mittens and by suction take a firm hold on the incandescent bulb, which may then be unscrewed in the usual manner.

A Prominent New England Supply House.

The interior of the salesroom and executive offices of the Anchor Electric Company, Boston, Mass., is represented in the accompanying illustration, which shows also the faces of some of its clerical staff. The establishment of this young but enterprising company is located in the sole New England agent, while switches, sockets and cut-outs of every conceivable variety manufactured in the Anchor Electric Company's factory on Congress street are in daily use for lighting the private offices in the rear, show boards, etc. A wall of Acme wire, for which this company is also agent, occupies a central position in the rear, while Crescent ceiling fans are displayed in various places. To the left and rear is an immense stock of Anchor porcelain goods, tubes, cleats, etc.

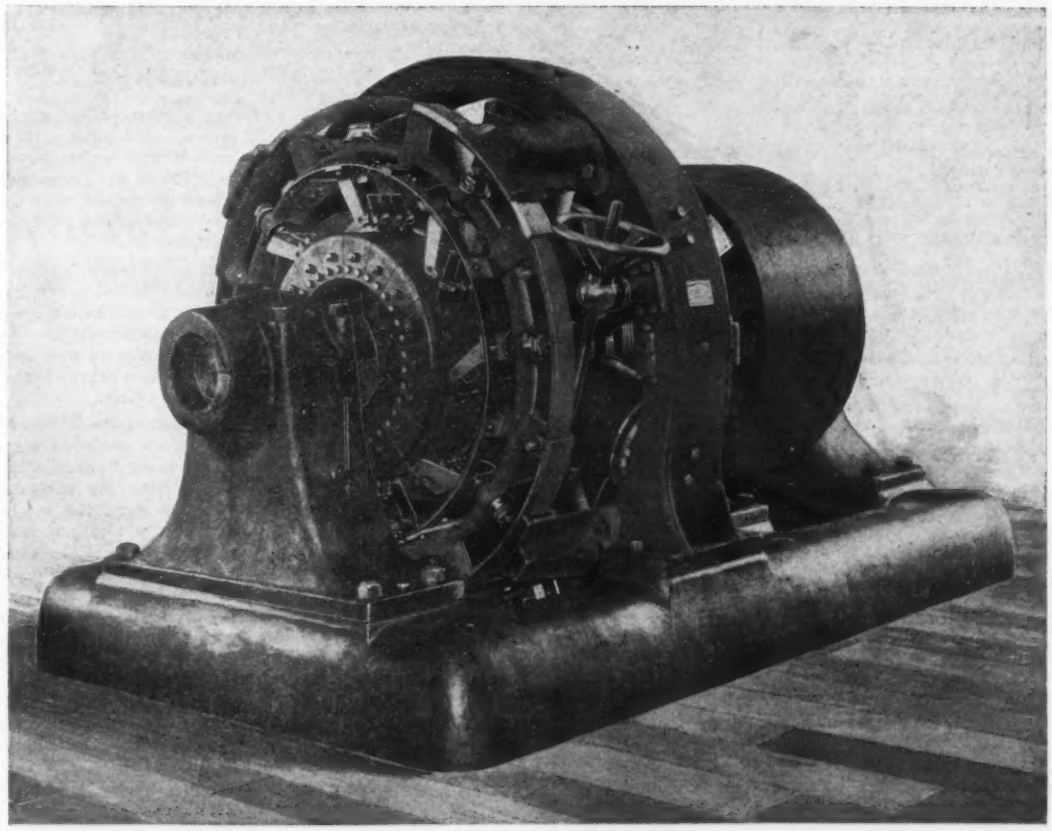
A NEW ENGLAND SUPPLY HOUSE.

The Dow adjusting balls, woven wire brushes, wasteless zincs, etc., are all kept in large quantities for the trade in New England as well as retail buyers. In the basement is an extensive line of supplies.

Generator for Electrolytic Service.

The accompanying engraving represents a 200-kw eight-pole generator recently designed by the General Electric Company expressly to meet the peculiar requirements of electrolytic work.

The armature is of the smooth core type; the coils are machine wound of flexible cable, and are so arranged as to admit of ready replacement in case of injury. The armature is so thoroughly ventilated and the



200 KW ELECTROLYTIC GENERATOR.

very centre of the "Hub" on one of the busiest streets, and is a model of completeness and convenience. Entering from the street are three spacious show windows where are the latest novelties in flush switches, sockets, cut-outs, etc., all manufactured by the Anchor Electric Company, together with the various novelties for which it is the exclusive agent in New England. A large show board covered with Anchor porcelain specialties, cleats, tubes, etc., makes a brilliant display, especially when lighted by successive pink and green lights in the evening. The main store is lighted by Helios arc lamps, for which the company is

current density in the winding so low that the machine runs unusually cool, even under full load during a long period.

The commutator shell is divided into sections, allowing the removal of segments without removing the commutator or disturbing other segments. The frame and base of the machine are massive and the bearings self-oiling and self-aligning. The generator here illustrated gives 1,330 amperes and 150 volts at 300 revolutions per minute. A larger machine is now under construction which will have an output of 3,600 amperes and 75 volts at 280 revolutions per minute.

NEWS OF THE WEEK

Financial Intelligence.

THE ELECTRICAL STOCK MARKET.

NEW YORK, April 13, 1895.

ELECTRICAL STOCKS were dull and uninteresting throughout the week. The rumored deal between the General Electric and Westinghouse Companies remains apparently where it was when the report was first circulated. It is current talk in Boston that the General Electric people are giving the impression that the deal is off and that Mr. Westinghouse is responsible for the failure to carry it through, but it appears to be impossible to obtain any authentic information on the subject.

AMERICAN BELL fluctuated rather queerly during the week, opening at 179¼ on Monday, climbing to 188 on Wednesday and then gradually declining to the closing figure. Of course all sorts of rumors are rife concerning the new telephone organization and it is probable that some of these account for the fluctuation referred to. A prominent Boston banker said in a scoffing mood: "I am reliably assured that Mr. ——, named as Boston director for the Standard Telephone Company, stands ready to put $4,000,000 into the enterprise if somebody will furnish the $4,000,000." A Bell Telephone director says: "I don't see what they want with $160,000,000. We would sell them the Bell Company for $60,000,000 and they could buy up the rest of the telephone stocks for $60,000,000 more, and have the whole thing and $40,000,000 of their $160,000,000 in their pockets."

ELECTRICAL STOCKS.

	Par.	Bid.	Asked
Chicago Edison Company	100	120	125
Edison Electric Ill., New York	100	97¼	98½
" " " Brooklyn	100	..	108
" " " Boston	100	..	..
" " " Philadelphia	100	..	115
Edison Ore Milling	100	13	15
Electric Storage Co., Philadelphia	100	..	30½
General Electric	100	33½	34
General Electric, pref	100	..	63½
Westinghouse Consolidated, com.	50	33½	34½
" " pref	50	51½	52

BONDS.

Edison Electric Ill., New York	100	105½	105½
Edison Electric Light of Europe	100	75	85
General Electric Co. deb. 5s	100	..	90¼

TELEGRAPH AND TELEPHONE.

American Bell Telephone	100	180	181
American District Telegraph	100	30	40
American Telegraph & Cable	100	89	91
Central & South American Telegraph	100	117	120
Commercial Cables	100	137	..
Erie Telephone	100	53	53½
Gold & Stock Telegraph	100	105	..
New England Telephone	100	67	69
New York & New Jersey Telephone	100	103	105
Postal Telegraph-Cable	100	63½	..
Western Union Telegraph	100	87½	87¾

ELECTRIC TRACTION STOCKS.

Baltimore Traction	25	15½	15¾
Binghamton RR. com	100	100	..
Brooklyn Traction	100	9	11
" " pref	100	..	53
Buffalo St. Ry	100	66	69
Cleveland City Ry	100	68	70
Cleveland Electric Ry	100	59	60
Chicago City Ry	100	305	315
Columbus St. Ry	100	46	49
Consolidated Traction of N. J	..	30	33
Electric Traction, Philadelphia	50	77¼	77¾
Long Island Traction	100	7½	8¼
Louisville St. Ry. com.	100	37	39
" " pref.	100	87	88
Metropolitan Traction, Philadelphia	100	91	91¼
New Orleans Traction	100	15	18
" pref.	100	56	60
North Shore Traction	100	..	..
" " pref	100	74	83
People's Traction $30 pd	25	57⅜	57¾
‡Philadelphia Traction	50	82⅜	82½
Rochester St. Ry	..	38	..
Union Ry. (Huckleberry)	100	112	115
West End, Boston	100	63	63½
" " pref	100	87½	..
Worcester Traction	100	..	13
" " pref	100	77	80

BONDS.

Buffalo St. Ry. 1st con. 5s	100	101	..
*Binghamton Railroad Co. 5s	100	99	100
*Columbus St. Ry. 1st 5s	100	9	..
Rochester St. Ry. 1st. 5s	100	95	97
*Union Ry. 1st. mtge 6s	100	105	108
*Westchester Electric 1st. mtge. 5s	100	98	101

* With accrued interest.

‡ Ex-rights.

Special Correspondence.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
Room 91, Hathaway Building, 620 Atlantic Ave.,
BOSTON, April 18, 1895.

THE PETTINGELL-ANDREWS COMPANY, Boston, has accepted the New England agency for the well-known "Brodie" tree insulators, manufactured by the Brodie Electric Company, of Manchester, N. H.

MR. F. E. GILBERT, of the Columbia Electric Company, Worcester, Mass., was a recent visitor to this office. Mr. Gilbert is a young man, but full of energy and ability, qualities which are bound to win for him continued success.

THE BRODIE ELECTRIC COMPANY, of Manchester, N. H., reports a good demand for its new automatic motor switch, and the "Brodie" tree insulators are also meeting with large sales. This company will very soon place some other specialties on the market.

MR. GEORGE THOMPSON, JR., president of the Thompson-Brown Electric Company, of Boston, accompanied by his wife, sailed from New York last Wednesday on the steamer Teutonic for Europe. He will be absent about five weeks and will combine business with pleasure.

THE COLUMBIA ELECTRIC COMPANY, of Worcester, Mass., is doing a nice business in the line of general electrical supplies. It has always on hand a complete and varied assortment and its prices compare favorably with larger competitors. Central station officials and contractors are rapidly recognizing this company as the supply house for Central New England.

THE ADAMS ELECTRICAL CONSTRUCTION COMPANY, 27 Snow street, Providence, R. I., has recently opened up for business with good prospects. N. P. Adams is general manager and Wm. Halstead treasurer. Mr. Adams is well up in the electrical business, having been connected with the old Edison General Company both in New York and Boston, as well as other corporations. He is well and favorably known in Providence, where he has been actively engaged for some time.

MR. C. W. KNIGHT, traveling representative of the American Electrical Works, of Providence, R. I., favored this office with a call this week, and reports business as being very good indeed, which isn't at all astonishing when one considers the excellent reputation of the company he represents, and the various wire manufactures it produces, together with the fact that Mr. Knight is a salesmen of the first order, popular and energetic, and has had an experience of about 16 years in wire manufacture.

BIBBER, WHITE & CO., 620 Atlantic avenue, Boston, have secured the New England agency of the Columbia Incandescent Lamp Company and the Wagner Electric Manufacturing Company, of St. Louis, Mo., which, with the general selling agency of the wire and cable products of the Crefield Electrical Works of Pawtucket, R. I., and the representation in New England of the specialties of the Cutter Electrical Manufacturing Company, of Philadelphia, has necessitated the enlargement of their business offices.

MR. GARDINER C. SIMS, of the Armington & Sims Engine Company, Providence, R. I., is one of the few men with whom a conversation relative to the past and present of the electrical business may be regarded as a treat. He has always been in close touch with the business from the early days of electric lighting, because of the immediate recognition given the Armington & Sims engine, owing to its general value and efficiency, and which recognition is continued to-day to a large extent, notwithstanding the most formidable competition. The briefest of interviews with Mr. Sims will readily reveal the fact that he has improved all the opportunities afforded him, and is a veritable encyclopedia on the business, at least from the commercial standpoint. It was our pleasure a few days ago to happen in upon him while he was consulting one of the old record books of his company, and which disclosed facts to him even that he had almost forgotten, as to the conspicuous part his engine has performed in the electrical industry. From August, 1881, to August, 1882, 97 of these engines were sold to the Edison companies, and in 1886 the record showed that 3 800 had been sold to various lighting companies—the output in manufacture increasing from 18 hp per day to 125 hp, and even more.

THE STANDARD THERMOMETER COMPANY, of Peabody, Mass., well and favorably known to the electrical trade, and enjoying an excellent reputation in the manufacture of arc lamps for incandescent circuits, is now placing before the trade a new arc lamp to be known as the "Upton" lamp and which is applicable for all circuits—direct current constant potential, constant current and alternating. This company has been actively engaged in the manufacture of arc lamps for incandescent circuits since 1888 and has produced successively the "Simplex" and "Knight" lamps, and more recently the "Ward" lamp, manufacturing its entire product in association with the Electric Construction and Supply Company, of New York. The "Upton" lamp is simple in construction, water-proof without the use of hoods, and conforms to all the requirements of the fire underwriters. It is made to consume four, five, six, seven, eight or ten amperes at the proper voltage. It is claimed that the "Upton" lamp possesses valuable improvements and merits over any of the lamps heretofore manufactured by this company. The factory of the company is one

among the most complete to be found anywhere, well equipped in every way and possessing all the necessary facilities in the line of manufacture. The New York office is at 39 Cortlandt street, and is in charge of Mr. Charles A. Bramhall.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
936 Monadnock Building, Chicago,
April 13, 1895.

J. HOLT GATES is busy hustling for the Elwell-Parker Electric Company, of Cleveland. Mr. Gates is one of the men who is always busy.

THE BELDING ELECTRIC ALARM MAIL BOX COMPANY is now comfortably located in the Unity building. A remarkably wide interest in this new device is reported.

CHAS. D. JENNEY, president of the Jenney Electric Motor Company, Indianapolis, was a recent visitor to Chicago. He reports that the new works are nearing completion, and will give facilities for turning out work rapidly.

THE METROPOLITAN ELECTRIC COMPANY has added to its long list of specialties a portable hose bridge, a new and very clever device for insuring the running of cars during a fire. Mr. W. H. McKinlock of this firm is absent on an Eastern trip.

THE SUNBEAM LAMP COMPANY has only one thing to regret in connection with the recent decision—it hasn't lamps enough to fill the orders piling up; but the company is increasing its capacity, and within a few days can handle everything that comes in.

THE WALLACE ELECTRIC COMPANY, Chicago, will within a few weeks occupy its new and commodious quarters at 305 Dearborn street. The new store extends from Dearborn street through to Plymouth place, and the offices and storeroom will be fitted up in a handsome manner. The Wallace Company has lately added to its present line of specialties the overhead devices and specialties manufactured by the W. T. C. Macallen Company, of Boston. The Boston incandescent lamp has also been added, and the apparatus manufactured by the Electric Selector & Signal Company is also a new acquisition. The Habirshaw wires, Iona specialties Whittingham electric car heater, Wallace railway specialties, Wirt brush, etc., are making many friends, and stand high in their respective lines. Wood's flexible pole bracket is fast becoming the standard article of its kind. In fact, the entire line of overhead appliances manufactured and sold by this company is growing in popularity.

THE WESTERN TELEPHONE CONSTRUCTION COMPANY has much of interest to report. Among new exchanges are mentioned Newark, O., 300 instruments. In this town the existing telephone company cut its rates to $10 and $15 a year, but the excellence of the Western system had the effect of making the exchange a complete success. At Winona, Minn., the company has completed an exchange of 300 telephones, which is considered one of the finest exchanges in the West. It is finishing up work on exchanges at Mattoon, Ill., 200 instruments; Marysville, O., 100; Johnstown, Pa., 200; Santa Rosa, Cal., complete exchange. A recent contract was signed for an exchange of 200 instruments at Mt. Vernon, O. The exchange at Two Rivers, Wis., is rapidly growing, and is a thorough success. The Union Stock Yards, Chicago, controlled by Armour & Co., has abandoned its present exchange and ordered a complete Western equipment. The shops of the company are working to their full capacity.

General News.

ELECTRIC LIGHT AND POWER.

BARDSTOWN, KY.—O. Arnold will let a contract May 1 for an electric light system.

CHARLOTTE, N. C.—An electric lighting plant is to be installed by the Charlotte *Observer*.

VERSAILLES, KY.—Address the mayor concerning the establishment of a electric light plant.

SHEBOYGAN, WIS.—H. J. Weigand is inviting bids up to April 29 for lighting the city by electricity.

SCOTTSDALE, PA.—The Scottsdale Pipe Company is in the market for electric cranes for its new foundry.

MARTINSBURG, W. VA.—The Martinsburg electric light plant has been purchased by W. E. Tebo for $18,500.

FLUSHING, MICH.—George E. Heriman may be addressed concerning the erection of an electric light plant.

CORTLAND, N. Y.—The Cortland & Homer Traction Company is about to put in new dynamos for electric lights.

TEMPLE, TEX.—The Temple Electric Light Company is contemplating the addition of new electrical equipment.

MONROE, LA.—Address Chas. G. Madison concerning an electric light outfit, to be purchased for the Monroe Athletic Club.

SHELBYVILLE, TENN.—The Shelbyville Water Company has purchased the lectric light plant, and will add new machinery.

LIVINGSTON, ALA.—Address W. K. Smith, secretary Commercial Club, concerning the city's new electric light plant, about to be put in.

WALTHAM, MASS.—The installation of a new electric light system is contemplated. Address the clerk of the Council for further details.

CHELSEA, MICH.—It was decided at a recent election to establish an arc lighting system at this place. Address the clerk of the Council.

LONGWOOD, FLA.—Three electric power plants are required by B. W. Hencke, civil engineer. Two are to be of 100 hp each, and one of 300 hp.

RUTLAND, VT.—The Marble City Electric Company has decided to enlarge its plant on Post street. A 100-hp engine and 150-hp boiler will be put in.

DETROIT, MICH.—A power house is to be erected by the Detroit Railway Company, and will be equipped with the most modern electrical machinery.

BALTIMORE, MD.—The City Council has appropriated $100,000 for the purpose of burying the city's electric wires. Address the clerk of the Council.

SYRACUSE, N. Y.—It is reported that the electric lighting system is to be extended in this city. The clerk of the Council can be addressed for information.

PENNSBORO, W. VA.—An electric lighting plant is to be established here in the near future. Charles W. Sprinkle can be addressed for further information.

LOCKPORT, N. Y.—It is reported that a municipal electric plant is to be established in this city. The clerk of the Council can furnish additional information.

ELDORADO SPRINGS, N. J.—A 21-year franchise has been granted W. G. Lewis and others by the Board of Aldermen to construct an electric light plant at this place.

GREEN ISLAND, N. Y.—A bill has been passed authorizing the erection of a municipal electric lighting plant at this place. The village clerk can give further details.

NORTH TONAWANDA, N. Y.—A bill has been passed authorizing the establishment of an electric lighting system. Address the clerk of the Council for detailed information.

CHESTER, PA.—Bids will be received for the lighting of the streets and public buildings of the city for a term of one year. The clerk of the Council can furnish information.

INGERSOLL, ONT.—The Ingersoll Electric Power & Light Company, with a capital of $45,000, has applied for a charter for the purpose of supplying electric power, heat and light.

PHILADELPHIA, PA.—The Diamond Electric Company will put in all necessary equipment to enable it to furnish power for stationary motors. The work is to be completed by May 1.

KINSTON, N. C.—It is reported that an election is to be held to decide the question of establishing an electric lighting system at this place. The town clerk can be addressed for details.

MARION, VA.—C. A. Sprinkle can give information concerning the establishment of an electric light plant to be operated by water power. The population is about 2,000. A 50-hp water wheel will be used.

CHATTANOOGA, TENN.—Address Thos. E. Brown, Jr., 38 Park Row, concerning an electric power plant, to be erected on Lookout Mountain for the St. Elmo & Lookout Mountain Railway Company.

NEW YORK.—A nine-story office building will be erected for the J. C. Ayer estate, to be wired and equipped throughout for electric lighting. Architect R. Naynicke, of 111 Fifth avenue, has charge of the work.

TAMPA, FLA.—The Consumers' Electric Light & Street Railway Company will remove its plant to the works on Hillsboro river, six miles from the city. Additional turbine wheels and electrical machinery will be added.

ST. LOUIS, MO.—A three-story store and office building, to be erected for G. Schuchmann at a cost of $25,000, after plans prepared by Architects C. W. Kellogg & Son, will be wired and fixtured throughout for electric lighting.

NEW YORK.—The twelve-story business building to be built for H. O. Havemeyer, 107 Wall street, after plans prepared by George B. Post, is to be wired and fixtured throughout for electric lighting. Estimated cost, $1,000,000.

FAYETTESVILLE, N. C.—An election is to be held May 5 to vote on the question of issuing $10,000 worth of bonds for the erection of a municipal electric lighting plant. Address the clerk of the Council for detailed information.

NEW YORK.—Plans have been prepared by Architects Lamb & Rich, 265 Broadway, for a fifteen-story office building at Nassau and Liberty streets, to cost $1,000,000. Among the improvements introduced will be electric lighting.

NEW YORK.—Plans and specifications have been prepared for a 15-story office building to be erected for John T. Williams, 54 Franklin street, at a cost of $600,000. The structure will be wired and fixtured throughout for electric lighting.

ST. PAUL, MINN.—Plans have been prepared by Architect C. E. Dickerman for a five-story brick and steel business building to be erected for Smith & Farwell at Sixth and Monmouth streets. The structure will be wired and fixtured throughout for electric lighting.

BOSTON, MASS.—Plans are being prepared for a mammoth apartment hotel to be erected on the Charles River, between Ashley and Chilmark streets, at a cost of $3,000,000. The structure will be provided with an electric plant. Messrs. Balch & Rackemann are the architects, and can be addressed.

THE ELECTRIC RAILWAY.

LANCASTER, PA.—The Lititz New Holland & Terre Hill Road has been granted entrance into the city.

LOCKPORT, N. Y.—The Lockport City Electric Railway Company has applied for an extension of its franchise.

CENTRALIA, PA.—The construction of an electric railway between this place and Ashland is contemplated.

ROME, N. Y.—The Rome City Railway Company is contemplating the equipment of its line with electric power.

BUFFALO, N. Y.—Surveys are being made for the route of the Buffalo & Niagara Falls Electric Railway Company.

PHILADELPHIA, PA.—The Camden, Gloucester & Woodbury trolley line will not be built to Glassboro this spring.

ONEIDA, N. Y.—An electric railway is projected between this place, Canastota, Clockville, Merrilsville and Oniontown.

COLERAINE, MASS.—William Donelson is interested in the construction of an electric road from Coleraine to Shelburne Falls.

ORANGE, N. J.—The Central New Jersey Traction Company has applied for a franchise to lay tracks on certain streets of the city.

BUFFALO, N. Y.—The Niagara Falls & Lewiston Railway Company has applied for permission to lay tracks on certain streets.

UPLAND, PA.—The Media, Middletown, Aston & Chester Electric Railway Company has applied for right of way through this village.

PORT BYRON, N. Y.—The construction of an electric railway from Auburn to this place is projected. The town clerk can be addressed.

AUBURN, N. Y.—The Auburn City Railway Company has been granted permission to operate a street railway on certain streets of the city.

NIAGARA FALLS, N. Y.—Capt. Brinker will commence work soon on the construction of the Niagara Falls & Lewiston Electric Railway.

ANNISTON, ALA.—An electric street railway at this place is projected by Howard W. Sexton. Work will be commenced in the near future.

DUNKIRK, N. Y.—The extension of the Dunkirk & Fredonia Street Railway line is contemplated. The secretary of the company can be addressed.

TAMPA, FLA.—The board of directors of the Consumers' Electric Light & Street Railway Company have decided to extend the line to Ybor City.

CANASTOTA, N. Y.—S. G. Gano, of Geneva, will probably begin the construction soon of an electric railway from Canastota to Sylvan Beach.

LAKEVILLE, L. I., N. Y.—The construction of a railway between this place and Old Westbury is contemplated. Address the village clerk for details.

EDGEWATER, S. I., N. Y.—The Midland Company has applied for a franchise to construct a line through St. Paul's avenue to the ferry at St George.

BROOKLYN, N. Y.—Work has been commenced on the construction of the Long Island Electric Railway system. A. R. Hart is president of the company.

ILION, N. Y.—The Mohawk, Herkimer & Ilion Street Railway Company has been granted permission to change its motive power from horses to electricity.

PENN YAN, N.Y.—An electric railway is projected from this place to Dundee, a distance of 12 miles. The town clerk can be addressed for further information.

CHARLESTON, S. C.—It is reported that the City Railway is to be purchased by a company who will equip same with electricity. John M. Riggs is president.

NORTH PROVIDENCE, R. I.—The Union Railway Company has applied for permission to lay tracks on Mineral Spring avenue, from the Pawtucket line to Charles street.

LANCASTER, PA.—An ordinance has been passed granting the Lancaster City Street Railway Company permission to extend its line through certain streets of the city.

LOCKPORT, N. Y.—The Common Council has granted permission to M. Johnson to complete the street railway. It is reported that the line will be extended to Olcott.

DANVILLE, VA.—The Danville Electric Railway is to be extended into the suburbs of this city. Arrangements are being made for the same, and S. F. Berkeley is interested.

CHATTANOOGA, TENN.—The Electric Street Railway Company will build a branch line to the baseball park. S. W. Divine is manager, and will furnish detailed information.

PHILADELPHIA, PA.—The Philadelphia & Ardmore Passenger Railway Company has been granted permission to extend its line. The general manager can furnish particulars.

WILKESBARRE PA.—An ordinance has been passed authorizing the extension of the Nanticoke Street Railway. Address the superintendent of the company for detailed information.

LAKE CHARLES, LA.—A recently organized company has been granted a franchise to construct an electric trolley road through this city. The clerk of the Council can furnish particulars.

HOBART, IND.—The Hobart Electric Railway Company has been organized for the purpose of building a line from this place to Chicago. A. Morrison is president, and A. J. Smith, secretary.

NEWTON, MASS.—The Newton Street Railway Company has petitioned for a new location for the purpose of constructing a street railway line to be operated by electricity from Waltham to Newton.

EAST GREENBUSH, N. Y.—The highway commissioners of this place have granted F. R. Barnes a franchise to construct and operate an electric railway from Albany to Castleton, through this place.

PARKERSBURG, W. VA. —The Park City line is to be rebuilt for the use of trolley cars by the Parkersburg Traction Company. W. R. Hurd, 320 Eighth street, can be addressed for further information.

WORCESTER, MASS.—It is reported that the North End Street Railway Company is to extend its line through Prescott and North streets. C. L. West, superintendent, can be addressed for information.

SPENCER, MASS.—The construction is contemplated of an electric railway from this place to West Warren, a distance of 15 miles. L. L. Currier, of Worcester, and T. J. Comins are among those interested.

BALTIMORE, MD.—The City Passenger Railway Company has been granted permission to extend its trolley line in the northeastern part of this city. Walter B. Franklin is president and can be addressed for details.

NEW BRIGHTON, S. I., N. Y.—The Staten Island Railway Company has been granted franchises to build trolley lines along Richmond Terrace, Jersey street and Richmond turnpike. The secretary can be addressed.

GLOUCESTER, MASS.—The contract will be awarded in the near future for the construction of the Gloucester, Beverly & Essex Street Railway from this place to Beverly. President Ferguson can be addressed for details.

PITTSBURGH, PA.—The McKeesport, Du Quesne & Wilmerding Electric Railway Company will receive bids until April 19 for the construction of connecting links between its Versailles and Fifth avenue termini. Address the secretary of the road.

SPENCER, MASS.—An electric railway from Spencer to West Warren will probably be established. I. L. Currier, Worcester, president; John Mulcahy, Hiram Gerald, Abin Hyde and others are directors. The proposed capital stock is $200,000.

ALBION, N. Y.—Surveys are being made for the construction of an electric line from Albion to Eagle Harbor to be known as the Beecher Electric Railway Company. Address the secretary of the Waterford Electric Railway & Power Company for details.

MILLERS FALLS, MASS.—An electric power house is to be constructed across Millers river. Two water wheels will furnish power to two electric roads, one to run from Millers Falls to Turners Falls, and the other from Turners Falls to Greenfield.

MONTICELLO, N. Y.—The Monticello & Navesink Traction Company has secured the right of way for its line between Monticello and Grahamsville; also the privilege of using the water of the Navesink river to furnish power to run its dynamos. Work is to begin soon.

CHATTANOOGA, TENN.—Col. D. M. Steward is interested in the construction of an electric railway to connect Chattanooga, Rossville and Chickamauga National Military Park. The estimated cost is $30,000, and the prospects are favorable for the consummation of the scheme.

BEAVER FALLS, PA.—The Shenango Valley Electric Street Railway, run between Sharon and Sharpsville, has been purchased by a number of capitalists, who have formed a company for the operation and improvement of the road. A. M. Jolly is president and A. R. Leyda secretary.

PHILADELPHIA, PA.—The Fairmount Park & Haddington Passenger Railway Company has been granted permission to lay tracks on Lansdowne avenue by the board of district surveyors. Permission has also been granted the Union Passenger Railway Company to lay tracks on certain streets of this city.

KINGSTON, N. Y.—The Rondout & Eddyville Railway Company has been incorporated for the purpose of operating a street railway, three miles in length, from this city to Eddyville. Wm T. Hiscox, Percival C. Smith, and others, of New York, are among the incorporators, and can be addressed for particulars.

NORRISTOWN, PA.—The court has granted a perpetual injunction against the Montgomery County Passenger Railway Company, restraining it from running cars on the branch line from Bridgeport to Sweedland, in Upper Merion township, a distance of one and one-half miles. The court held that the electric railway tracks occupy land belonging to the Pennsylvania Railway Company and pass under its bridge in Upper Merion.

GENEVA, N. Y.—The Geneva Surface Railway Company, the Geneva & Waterloo Railway Company, the Waterloo, Seneca Falls & Cayuga Lake Railway Company, and the Seneca Railway Company have consolidated under the name of the Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Company, with a capital stock of $450,000. The road will be extended from Auburn to Syracuse via Skaneateles. Clifford E. Beebe and William Nottingham are among the directors.

Personal Notes.

WILLIAM H. McKINLOCK, president of the Metropolitan Electric Company, Chicago, was called east last week on business. He was accompanied by Mrs. McKinlock, son and daughter, who left New York Wednesday, April 10, on the steamship La Touraine, for Paris, France, to be absent a year.

PROF. ALEXANDER MACFARLANE was married on April 8 at San Antonio, Tex., to Miss Helen Martha Sweringen. The numerous friends and admirers of the accomplished professor and physicist will, we feel sure, join us in wishing the happy couple their full quota of connubial happiness and material prosperity.

MR. C. N. BLACK has succeeded Mr. E. W. Phipps as superintendent of the Brush Electric Company, Cleveland, O., the latter gentleman having tendered his resignation on April 8. Mr. Black, who has been assistant superintendent, and also, in connection with Mr. Brush electrician of the company, was graduated from Princeton University in 1888 with the degree of B. A. He pursued a two years' post-graduate course in electrical engineering under Prof. Brackett, after which, in 1890, he secured a position in the shops of the Brush Electric Company, where he has had an experience in every department, and, therefore, is personally familiar with the work required of each man in the shops, and, in nearly all cases, has performed similar work himself. At one time he was at the head of the drafting room, and is an expert draftsman. Again he was in charge of the testing room, and became perfectly familiar with the various machinery manufactured by the Brush Company. Not long since Mr. Black received an offer from one of the largest manufacturers of electrical apparatus in the country, but preferred to remain with the Brush Company. His association and work with Prof. Brackett, of Princeton, and Mr. Brush, of Cleveland, together with his practical experience in the work, have more than ordinarily fitted him for the position of superintendent of the Brush Electric Company. Mr. Black's successor as assistant superintendent will probably be appointed from some of the men in the works.

Miscellaneous Notes.

THE MECHANICS' INSTITUTE, at Peterborough, Ont., is taking steps to establish a reference library of manufacturers' catalogues, for the use of its members.

THE ELECTRICAL ENGINEERING SOCIETY of Lehigh University, at its regular monthly meeting last week, was favored with a paper on the monocyclic system, by Mr. Gibson, and a talk by Prof. Powell on the coupling of dynamos.

TELEPHONE RENTALS in nearly every place in western New York except Buffalo and Rochester have been reduced 10 per cent. Michigan has made a general reduction in city rentals of from 20 to 35 per cent, and the Central Union Telephone Company, operating in Illinois, Indiana, Iowa and Ohio, has reduced rentals about 25 per cent.

THE UNIVERSITY OF WISCONSIN has arranged for the annual inspection tour of junior electrical and mechanical engineering students, which is to be

taken as usual during a portion of the spring intermission. The party will leave Madison on Wednesday of examination week at 5:10 p. m. Inspections in Chicago will begin on Thursday morning, and the following works will be visited by the electrical engineers: Thursday—Works of the Illinois Steel Company, at South Chicago; works of Pullman Company, at Pullman. Friday—Works of Siemens & Halske Electric Company, at the Grant Locomotive Works; works of Western Electric Company. Saturday—Electric power plant of Metropolitan Elevated Railway, works of Fraser & Chalmers, electric plant of Auditorium Hotel and theatre. Monday—Electric plants of Chicago Edison Company, cable railway plant, electric railway plant. Tuesday—Works of Pabst Brewing Company, Milwaukee; Pabst power house, power house of Milwaukee Street Railway Company, central exchange of Wisconsin Telephone Company. On Monday, Tuesday and Wednesday electrical students may, if they desire, leave the main party and join the mechanical students in visits to the great industries of Joliet, Waukegan and Milwaukee.

Trade and Industrial Notes.

THE KNAPP ELECTRIC & NOVELTY COMPANY, 47 Warren street, New York, is receiving increased orders over last year for its battery motors and outfit. Several improvements have been made which add to their popularity.

THE ELECTRIC APPLIANCE COMPANY, Chicago, is opening the spring campaign on the Meston alternating current fan motor with considerable success. A number of improvements have been made in this season's machine.

THE KEYSTONE ELECTRIC COMPANY, of Erie, Pa, has just issued a neat catalogue of its well-known motors and dynamos. The special reversible elevator motor made by the company is described at length, with illustrations.

SPRAGUE ELEVATORS AT MINNEAPOLIS.—The contract for Sprague electric elevators for the new Minneapolis pulbic building was granted on April 14, after a lengthy contest with a combination of hydraulic elevator manufacturers.

GARRETT, MILLER & CO., of Wilmington, Del., have purchased the electrical department of the Delaware Electric & Supply Company, and will largely increase the supply and construction business. A full line of supplies for electric lighting, power and traction work will be carried, as well as a complete stock of house goods.

THE GOUBERT MANUFACTURING COMPANY, 14-16 Church street, New York, is doing quite an extensive business in large feed water heaters, one of which is described in another column. Many of these are installed in electric light and railway plants throughout the country, and are the subjects of a large amount of favorable comment.

THE GENETT AIR BRAKE COMPANY, 33 Wall street, New York, is distributing a couple of pamphlets describing the Genett brake, and containing a reprint of the paper read by Mr. E. J. Wessels at the Atlanta Street Railway Convention last October. The pamphlets are exceedingly tasteful as to both typographical work and outside finish.

E. V. BAILLARD, 106 Liberty street, New York, has removed his quarters to the third floor of the same building, in order to obtain the additional space necessary to handle his increasing business. He will put in more machinery so as to have ample facilities for turning out work promptly. Mr. Baillard's specialty is model and experimental apparatus, and his shop is fully equipped for this class of work.

THE FERRACUTE MACHINE COMPANY, Bridgeton, N. J., has published a very comprehensive illustrated catalogue of its presses, of which it makes an extensive line. There are cutting, horning and wiring presses drawing and embossing presses, presses for punching and shearing, presses for stamping, and other presses too numerous to mention. It is difficult to imagine any sort of press which is not included in the list presented by the catalogue referred to.

THE ELECTRIC CONSTRUCTION & SUPPLY COMPANY, of Wilmington, Del., has been awarded the contract for furnishing the electrical material for the electric light, power and railway station being built at Fort Delaware. The McCay-Howard Engineering Company, of Baltimore, received the contract for engines, boilers and generators, and the Westinghouse Electrical & Manufacturing Company of Pittsburgh, Pa., will build the electric locomotive for the trolley line.

THE BERLIN IRON BRIDGE COMPANY, East Berlin, Conn., is building an iron retort house for the Collins Company, Collinsville, Conn., and has the contract for the new Capitol avenue bridge at Hartford, Conn. The bridge will consist of two span plate girders, each 82 feet long, and will have a 25-foot roadway and two sidewalks. It has also completed the new boiler house for the Hartford Gas Light Company, at Hartford, Conn. The roof is anti-condensation. The New Jersey Magnetic Concentrating Company is putting up a new dryer plant at Lyon Mountain, N. Y., which will be entirely of iron, designed and built by the Berlin Iron Bridge Company.

THE HERCULES FLOAT WORKS is the name of a new corporation just organized at Springfield, Mass., for the manufacture of seamless copper floats for use with steam and hydraulic apparatus. The officers are H. S. Anderson, president and treasurer; F. Engelhard, manager, and H. S. Anderson, H. H. Parkhurst, F. Engelhard and F. H. Engelhard directors. The office and factory are located at 54 Taylor street. This float is manufactured under a newly patented process, is made without seams, and said to be superior to hard rolled metal. It is claimed to be perfectly even and homogeneous throughout, and absolutely impervious to water.

THE PHŒNIX INTERIOR TELEPHONE COMPANY, 181 Liberty street, New York, is the name of a new enterprise recently established by Messrs. Geo. W. Sutton and John H. Scofield. The new concern reports the outlook very encouraging as is evidenced by the fact that orders have already been taken from the Clark Thread Company, of Newark, N. J.; Passavant & Company, New York; The Royal Baking Powder Company, New York; J. C. Hoglan, president Royal Baking Powder Company, residence; R. Hoglan, president Cream Tartar Company, residence and factory, New York; Colored Orphan Asylum, New York; House of the Good Shepherd, Brooklyn; F. G. Smith, piano factory, Brooklyn; McLaughlin Brothers, Publishers, Brooklyn, and Flint, Eddy & Co., New York.

THE MATHER ELECTRIC COMPANY, of Manchester, Conn., reports a continuation of the large amount of new business secured. The following sales were made last week: The C. Weyand Brewing Company, Buffalo, N. Y., one 40-kw direct connected generator; Robert Walker, M.D., Warnerville, Pa., one 00 light and one 250-light ring type dynamo; G. M. Angier & Company, Boston, Mass., one 3-hp Manchester type motor, and one 250-light ring type dynamo; William Oswald, New Orleans, La., three 5-hp, one 10-hp, one 15-hp and one 30 hp Manchester type motor. Through J. Holt Gates, of Chicago, Western contractor, one 60-kw 220-volt direct connected multipolar generator for the Westville Coal Company; one 60-kw and one 85-kw 220-volt multipolar generators for other electric coal mining works, of which class of work the Mather Company is making a specialty; one 30-kw and one 45-kw multipolar generator for isolated lighting. B. P. Sturtevant & Co., Chicago, two 20-hp, Manchester type motors, and Burtis & Howard, Minneapolis, Minn., one 50-light ring type dynamo, third order.

THE WALKER MANUFACTURING COMPANY, Cleveland, O., reports the following contracts closed since April 1, 1895, which serve to show the popularity its improved generators and motors are gaining: St. Charles Street Railway Company, New Orleans, La., three 200-kw direct-coupled generators; Corning & Painted Post Street Railway Company, Corning, N. Y., two 125-kw direct-coupled generators; Channon & Wheeler, Quincy, Ill., one 75-kw belted power generator; Manhattan Beach Hotel & Land Company, New York, one 60-kw belted generator; Norfolk & Ocean View Railway Company, Norfolk, Va., two 250-kw belted generators, three double car equipments, 50-hp steel motors, and two double car equipments, 30-hp steel motors; E. A. Darling, Superintendent Columbia College, New York, one 50-kw belted generator; Buffalo, Kenmore & Tonawanda Electric Railway Company, Buffalo, N. Y., two double car equipments, 25-hp steel motors; Stern & Silverman, Philadelphia, Pa., for Rapid Railway Company, Detroit, Mich., two 200-kw belted generators and eight double car equipments, 50-hp steel motors; Dunkirk & Fredonia Railway Company, Fredonia, N. Y., one double car equipment, 25-hp steel motors; Scheneley Park & Highlands Railway Company, Pittsburgh, Pa., three double car equipments 30-hp steel motors. There has also been a marked increase in the orders received for general work as well as electrical.

Business Notices

BATTERY CUT-OUT, CHEAP.—Sensitive, reliable, never requires attention. Gas lighting much improved by its use. Electric Supply Company, of 105 South Warren street, Syracuse, N. Y.

AN ELECTRIC ELEVATOR PATENT SUIT.—As much has been said of the patent suit which has been brought against our company by the Otis Company, we thought it might be well to let your readers know the facts in the case. The patent on which the suit is brought is No. 324,621, issued Aug. 18, 1885. The claim is made by the Otis Company that this patent gives them the sole right to run elevators by shunt wound motors, with a low resistance armature. It is not a question in this suit as to how the motor is connected to the elevator, whether by worm or spur gearing or by belting, nor does it matter how the gearing or belting is arranged that connect the motor to the elevator nor what kind of controller is employed for operating the motor. What is claimed is the application of the electric motor to an elevator. If a man now owning an elevator which is driven through a countershaft by a gas engine, a hot air engine, or a steam engine should buy any well-known make of motor of the kind described above and employ any one to remove this engine and put the motor in its place to drive the countershaft, and through the countershaft the elevator, he would infringe this patent according to the claims of the Otis Company. Our patent attorney in the case is Mr. Livingston Gifford, and the electrical expert is Mr. Franklin L. Pope.

A. B. SEE MANUFACTURING CO., 116-120 Front street, Brooklyn, N. Y.

Illustrated Record of Electrical Patents.

UNITED STATES PATENTS ISSUED APRIL 9, 1895.

[In charge of Wm. A. Rosenbaum, 177 Times Building, New York.]

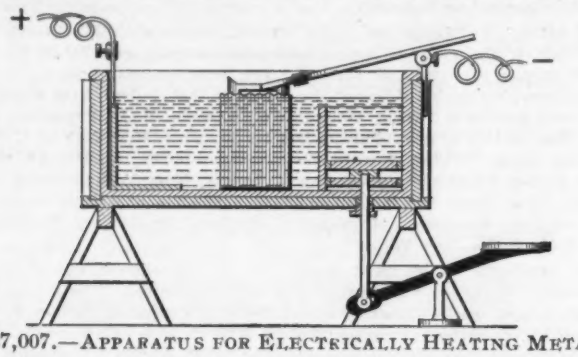
536,996. ELECTRODE; H. T. Barnett, London, England. App. filed Dec. 27, 1893. In an electrode the combination of a carbonized pile fabric with a conducting support provided with guards extending beyond the ends of the pile, and with which the pile fabric is connected mechanically and electrically.

537,004. App. filed Dec. 11, 1893; 537,005. App. filed April 26, 1894; 537,006. App. filed Aug. 24, 1893; 537,007. App. filed Jan. 23, 1895; Electric Heating and Welding Apparatus; G. D. Burton, Boston, Mass. These patents cover details of electric welding and heating apparatus.

537,008. App. filed Sept. 5, 1892; 537,010. App. filed Dec. 7, 1892; 537,011. App. filed Dec. 7, 1892; 537,012. App. filed March 3, 1893; 537,014. App. filed May 4, 1893; 537,402. App. filed Oct. 11, 1894, G. D. Burton, Boston, Mass., and E. B. Angell, Somerville, Mass. Electric Welding and Heating Apparatus. These patents cover details of electric welding and heating apparatus.

537,032. ELECTRIC CLOCK; F. L. Gregory, Chicago, Ill. App. filed Jan. 30, 1894. The combination of a time train and a time train actuator, also a time train stopping device carried by the actuator and adapted for engaging and stopping the time train at each end of the stroke of the actuator and for positively locking the time train against forwatd or backward movement.

37,058. INCANDESCENT LAMP; C. A. Merritt, Birmingham, Ala. App. filed Sept. 17, 1894 The combination of a series of conducting wires to connect the carbons, the wires connected at their upper ends to contact post



No 537,007.—Apparatus for Electrically Heating Metal.

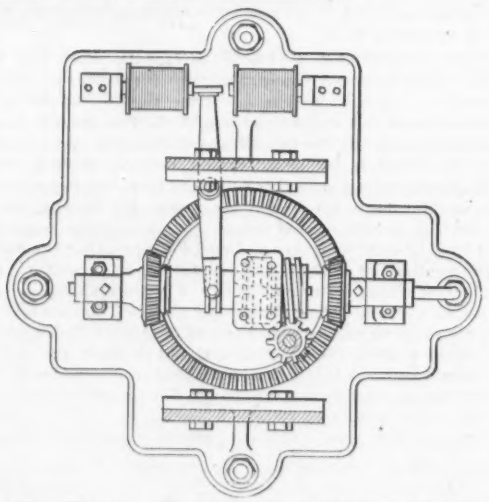
embedded in the insulating filling the contact plate having a head attached to the base by screw threads, a switch journaled to the contact plate between the head and the base, the switch adapted to make an electric connection to one or more of the contact posts as desired.

537,118. ELECTRICAL INDICATOR; E H Johnson, New York, N. Y. App. filed Oct. 1, 1891. The combination of an indicating device, electro-magnetic means for moving the indicating device, and a retarding device comprising an elongated dash pot, an elongated hollow plunger open at its inner end, and a mechanical connection from both sides of plunger to the device, so as to move the plunger in both directions.

537,124. ELECTRICAL STEERING GEAR; R. Nourvy, Nouveau Phalere, Greece. App. filed March 12, 1894. In a compass for the automatic steering of vessels the combination with the compass card controlled by terrestrial magnetism and having the toothed periphery and the alidade adjustably mounted on said compass card, of the gear wheel movable into and out of gear with the teeth on the compass card, an operating handle for said gear and means for holding the alidade against movement around its pivotal centre

537,130. ARC RUPTURING DEVICE; E. A. Sperry, Cleveland, O. App. filed Oct. 16, 1894. An unprotected pole formed by one end of a magnet or contact constituting an electrode, also a co-operating electrode means for relative movement of the two electrodes, the final break of contact while disconnecting being in a certain line with reference to the pole, and an intercepting shield of solid insulator mounted upon the polar electrode, the face of which is in a plane practically at right angles to the said line

537,133. ELECTRIC RAILWAY SIGNAL APPARATUS; G. L. Thomas, Brooklyn, N. Y. App. filed April 23, 1894. The combination with a rotary spindle, means for actuating the spindle and electric circuits including electromagnets for releasing the spindle at intervals, also reciprocating counterbalanced arms mounted independently and having operating wheels fixed to reciprocate with the arms, also a master wheel adapted to engage the arm-operating wheels successively and arm retaining devices having holding engagements with the master wheel at intervals.



No. 537,124.—Electrical Steering Gear.

537,140. DEMAGNETIZER; E. F. Gooding and G. W. Scovil. Elgin, Ill. App. filed Dec. 29, 1894. In a demagnetizer apparatus the inclosing case provided with a cover which has also a socket to make and break the circuit when box is opened or closed, and a magnet having the core connecting a plate with the table, and a coil wire with the ends insulated from each other, but fitting a lamp socket with the effect to connect the wires to the circuit.

537,161. POLICE SIGNALING APPARATUS; W. H. Kirnan, Bayonne, N. J. App. filed Dec. 28, 1892 In a police signaling apparatus the combination with an alarm bell at the receiving station, of a relay controlling the circuit of such bell, a spring dog which drops back of the armature and holds the bell circuit closed, and a hand pull for withdrawing the spring dog.

537,194. App. filed June 18, 1894; 537,195. App. filed April 14, 1894; 537,197. App. filed Nov. 3, 1893; 537,196. App. filed June 18, 1894; 537,198. App. filed August 9, 1894; 537,199. App. filed Feb. 20, 1894; 537,200. App. filed April 10, 1894; 537,414. App. filed Feb. 17. 1893; 537,415. App. filed July 6, 1893; 537,416. App. filed Oct. 12, 1894. Supply Systems for Electric Railways; J. H. Guest, Boston, Mass. These patents cover details of construction relating to conduit railway systems.

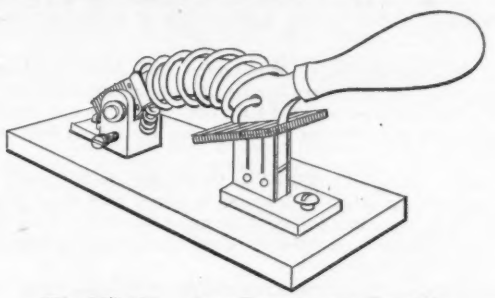
537,228. CUT-OFF OR SAFETY ATTACHMENT FOR ELECTRICAL CONDUCTORS; J. Parkinson, M. Springfield and C. Mills, Philadelphia, Pa. App. filed Oct 10, 1894. An attachment for conductors consisting of a bridge having a section pivoted thereto, an insulated piece attached to the section, and a block pivoted to the piece, with a conductor leading from the block to the pivoted section and another conductor attached to the pivoted section which is intermediate, the latter conductor being adapted to serve as a conveyor of the current in case of accident.

537,259. NON-ARCING SWITCH; A. Wurts, Pittsburgh, Pa. App. filed April 14, 1893. A sliding contact, a stationary contact, a reciprocating switch, and a series of extinguisher bars arranged parallel to the path of the sliding contact and composed of non-arcing metal.

537,268. RAILWAY SIGNAL; H. E. Boothby, Chicago Ill. App. filed Nov. 30, 1892. A signal having apertures in front and back to be used for signaling day and night, both signals being adapted to move independently out of the aperture and electrically connected to magnets to make a contact and so move signal.

537,271. INCANDESCENT LAMP BASE; W. C. Bryan, Bridgeport, Conn. App. filed Dec. 20, 1894. An incandescent porcelain base having a central opening and a surrounding recess on one side with a sheet metal screw-threaded terminal adapted to be flanged on to the base, and with a second flange to fit the recess.

537,282. TELEPHONY; E. F. Frost, Washington, D. C. A telephone system having a microphone, the combination therewith of an extra current or spark coil, the two being in parallel across the line circuit.



No. 537,130.—Arc Rupturing Device.

537,283. TROLLEY; Z. T. Furbish and G. A Staples, Augusta, Ga. App. filed Sept. 25, 1894. In combination with the pole, a removable cap having ears, a socket pivoted to the ears, a trolley wheel supported by the socket and a connection between the lower end of the socket and the pole platform

537,321. INSULATING COMPOUND; A. C. Thompson, St. Louis, Mo. App. filed July 30, 1894. A composition of different chemicals which can be used like paint for insulating connections, etc

537,336. PROCESS OF AMALGAMATING AND SEPARATING METALS; H. M. Baker, Brooklyn, N. Y. App. filed June 22, 1894. A dry process of amalgamating and separating which consists in mingling with the material an amalgam of quicksilver and iron, and then passing the material through a magnetic field.

537,343. ELECTRICAL MEASURING INSTRUMENT; E. Hartman and W. Braun, Bockenheim, Germany. App. filed Nov. 27, 1891. A measuring device consisting of two wires held between fixed supports and arranged to have a current traverse them, in combination with a flexible connection, a transmitting connection, and an axle to which the transmitting connection is secured, and an indicator secured to the axle.

537,354. TRAVERSING APPARATUS FOR COMMUTATORS; J. Pease, Apperley Bridge, Eng. The combination with a supporting frame of a worm shaft, a crank slide wheel, a gearing connecting the worm and the wheel so as to regulate the extent of traverse desired to be imparted to the commutator or a dynamo.

537,358. ELECTRIC BATTERY SYSTEM; A. J. Powell and W. H. Hall, Brooklyn, N. Y. App. filed Nov. 13, 1894. The combination of an electric motor and suitable electrical connections to a main battery and two sets of switch bars to automatically reverse one pair of the switch bars to open the circuit when the main battery is connected to the motor, and means for reversing the other switch bars at will independently of the first pair.

537,404. APPARATUS FOR ELECTRICALLY HEATING METAL; G. D. Burton, Boston, Mass. App. filed Nov. 6, 1894. The combination of a tank containing an electrolytic bath, a carriage to hold the metal and means for regulating the flow of liquid from the receiving vessel, and suitable conductors connecting the electrolytic bath and the metal to be heated with opposite electric poles.

537,405. APPARATUS FOR ELECTRICALLY HEATING METAL; G. D. Burton, Boston, Mass. App. filed March 16, 1895. The combination of a tank containing an electrolytic bath, a carriage to hold the metal, and means for regulating the flow of liquid from the receiving vessel, and suitable conductors connecting the electrolytic bath and the metal to be heated with opposite electric poles.

537,412. RHEOSTAT; J. C. Pyfe, Chicago, Ill. App. filed Jan. 24, 1895. A rheostat having a magnetic contact adapted to engage another contact and be held thereby, together with a magnet shunt for short circuiting the magnetic field of the magnetic contact for releasing the said contact.